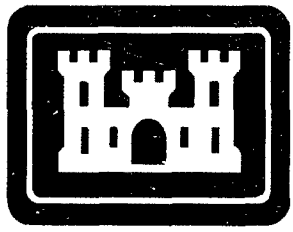
3665



US Army Corps of Engineers

Toxic and Hazardous Materials Agency

FINAL

ASBESTOS SURVEY FOR FORT POINT U.S. COAST GUARD STATION

Volume I

Presidio of San Francisco

Contract No. DAAA15-90-D-0018
Task Order 0002, Data Item A004

Prepared by:
R.L. Stollar & Associates, Inc.
Urie Environmental Health, Inc.

Prepared for:
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland 21010-5401

September 1991

THAMA Form 45, 1 Jul 90

FINAL

ASBESTOS SURVEY FOR FORT POINT U.S. COAST GUARD STATION

SEPTEMBER 1991

Contract No. DAAA-15-90-D-0018
Task Order 0002, Data Item A004

The Presidio of San Francisco
Phase II Environmental Study

Volume I

Prepared by:

R. L. STOLLAR & ASSOCIATES INC.
URIE ENVIRONMENTAL HEALTH, INC.

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
U.S. ARMY TOXIC AND HAZARDOUS MATERIALS AGENCY

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EXECUTIVE SUMMARY

R.L. Stollar and Associates, Inc. (RLSA) conducted an asbestos survey and bulk sampling of materials at the Fort Point U.S. Coast Guard Station (FPUSCGS) buildings to delineate the location and extent of asbestos-containing materials (ACM) at the facility. The U.S. Coast Guard Station is located on Presidio of San Francisco property along the San Francisco Bay. The facility consists of nine buildings ranging in size from 108 square feet (sq ft) to 8,852 sq ft, totalling 20,905 square feet. The survey was conducted in accordance with procedures outlined in TM5-612, Asbestos Control. Assessment of friable ACM was made using the worksheets included in the Guide for Asbestos Hazard Assessment in U.S. Army Facilities. From damage/risk and exposure values obtained from these worksheets, recommended management corrective actions were determined.

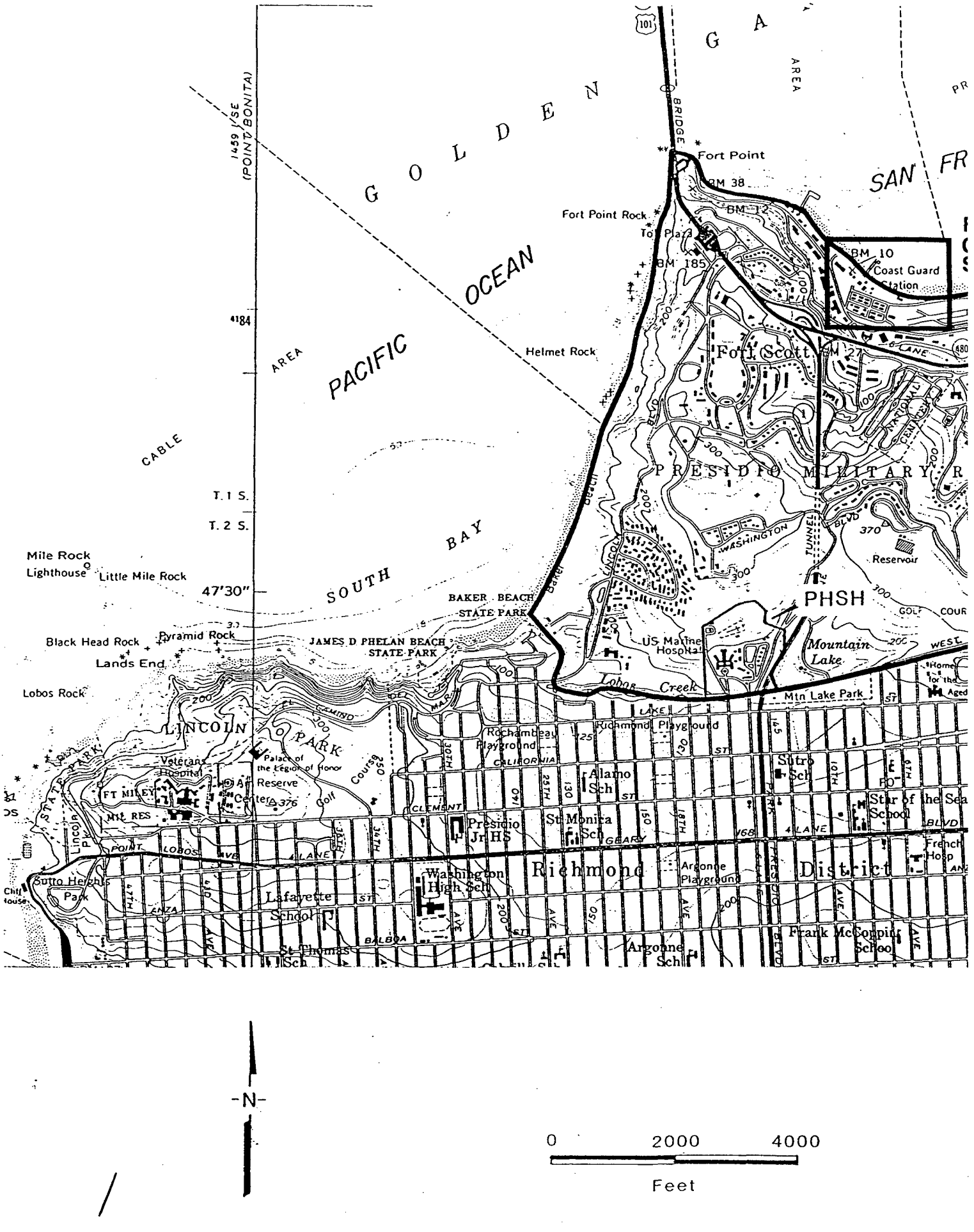
Results of Survey and Sampling

Friable asbestos was found in two of the buildings: the Officer in Charge's (OIC) residence (Building 992) and a vehicle hangar building (Building 994). Both are currently in use and occupied. Three other buildings, currently occupied, contained minor amounts of nonfriable ACM.

Approximately 275 linear feet (lf) of air ductwork in the OIC's residence, Building 992, was found to be wrapped with material containing 25-55 percent chrysotile asbestos. A supply air duct has become partially disconnected in the crawl space, possibly causing it to act as a plenum, posing a potential health hazard to residents. Air monitoring should be conducted as soon as possible within the residence to determine whether asbestos fibers are being introduced through the air supply system. Joint compound sampled behind electrical fixtures in Building 991 was found to contain 1-5 percent chrysotile asbestos. This same joint compound may be present in several rooms of the residence as skim coat on Sheetrock walls or ceilings which selectively replaced the original lath plaster walls and ceilings. Records specifying which walls and ceilings were replaced could not be found. Prior to any renovation, remodeling, or demolition, additional sampling and inspection should be conducted to determine which walls are Sheetrock with skim coat and whether the skim coat contains asbestos.

Building 994 contains 228 sq ft of ceiling tile which contains 1-5 percent chrysotile asbestos. Joint compound samples collected here also contained 1-5 percent chrysotile asbestos. Approximately 350 sq ft of floor tile and mastic in Building 994 was found to contain 5-10 percent chrysotile asbestos.

One room in Building 991 contains 80 sq ft of linoleum floor material which contains 20-25 percent chrysotile asbestos. A work surface in Building 995 was covered with linoleum containing 1-5 percent chrysotile asbestos. Another work surface in Building 998 was covered with floor tiles also containing 1-5 percent chrysotile asbestos.


GOLDEN GATE AREA
PACIFIC OCEAN
SOUTH BAY
CABLE
1459 I/SE (POINT BONITA)
4184
T. 1 S.
T. 2 S.
47'30"
Fort Point
BM 38
BM 12
Fort Point Rock
BM 185
BM 10
Coast Guard Station
Helmet Rock
Fort Scott
PRESIDIO MILITARY R
Mile Rock Lighthouse
Little Mile Rock
Black Head Rock
Pyramid Rock
Lands End
Lobos Rock
BAKER BEACH STATE PARK
JAMES D PHELAN BEACH STATE PARK
Baker Beach
Reservoir
PHSH
US Marine Hospital
Mountain Lake
Lobos Creek
Mtn Lake Park
LINCOLN PARK
Veterans Hospital
Palace of the Legion of Honor
Golf Course
FT MILEY
Mil Res
Lincoln Pk
POINT LOBOS AVE
Sutro Heights Park
Rochambeau Playground
Richmond Playground
Alamo Sch
Sutro Sch
Presidio Jr HS
St Monica Sch
Star of the Sea School
Washington High Sch
Richmond District
Argonne Playground
Lafayette School
St Thomas Sch
Argonne Sch
Frank McCoppin School
French Hosp
-N-
0
2000
4000
Feet

QUADRANGLE LOCATION

Source : USGS Topographic 7.5-Minute Series
San Francisco North, Calif.,
Photo Revised 1968 and 1973

R.L. STOLLAR & ASSOCIATES INC.
Denver, Colorado

Location of the Presidio of San Francisco

PSF RI, 1991

Date: July, 1991

Figure 1.2-1

2

Recommended Corrective Actions

It is recommended that the air ductwork in Building 992 with the asbestos-containing duct wrap be abated as soon as possible, either by removing the wrap or by removing and replacing the ductwork. If further sampling indicates that the skim coat on Sheetrock walls and ceilings in this building contains asbestos, removal should be scheduled as part of the normal maintenance and repair cycle. Ceiling tiles and joint compound in Building 994 should also be removed as part of the normal maintenance and repair cycle. No immediate action is required for the nonfriable tile and linoleum in Buildings 991, 994, 995, and 998. In the event that these buildings become occupied, these areas should be inspected periodically as part of an Operations and Maintenance (O&M) Program.

Costs for Removal of ACM

Assuming that the skim coat on the Sheetrock that was used to replace selected lath and plaster walls in Building 992 contains asbestos, it is estimated that the cost for air monitoring and removal of all ACM identified during this survey at FPUSCSG is estimated to be $55,000. If the skim coat does not contain ACM, the cost would be in the neighborhood of $18,000. This removal does not include joint compound used around electrical fixtures and Sheetrock joints and corners.

1.0 INTRODUCTION

1.1 TASK DESCRIPTION

R.L. Stollar and Associates, Inc. (RLSA) conducted an asbestos survey of the Fort Point U.S. Coast Guard Station (FPUSCGS) buildings. This survey included bulk sampling of materials suspected of containing asbestos. The survey and sampling was conducted in accordance with appendix A, Surveying for Asbestos, Documentation and Recordkeeping. RLSA was not required to develop an inspection priority list for Presidio of San Francisco as discussed in appendix A. This report delineates the location and extent of all asbestos-containing materials (ACM) present and differentiates between friable and nonfriable asbestos. This report also recommends corrective actions to be taken and provides estimated costs for corrective action.

The survey, sampling, and report requirements are specified in paragraph 3.2.2.7.1 of Contract DAA15-90-D-0018, Task Order 0002 as modified by Modification 000201 which states, "The contractor shall develop and submit a work plan for conducting an asbestos survey of the FPUSCGS buildings. The contractor shall then implement the plan which shall include bulk sampling of materials suspected of containing asbestos. The contractor shall conduct the survey and sampling for asbestos in accordance with enclosure 1 (Surveying For Asbestos, Documentation and Recordkeeping). The contractor shall not be required to develop an inspection priority list for PSF (as discussed in enclosure 1, page 2, first paragraph). A summary of Technical Bulletin (TB) MED 513 is at enclosure 2. A copy of the U.S. Army's Technical Manual (TM) 612, Asbestos Control, will be provided to the contractor upon modification of the task. Based upon the sample analysis, the contractor shall deliver a report which delineates the location and extent of all asbestos containing materials present, differentiating between friable and nonfriable asbestos. The contractor shall further recommend corrective actions to be taken and provide estimated cost(s) for corrective actions".

1.2 SITE DESCRIPTION

The Fort Point U.S. Coast Guard Station is located on the south shore of the Golden Gate along San Francisco Bay, east of Fort Point (figure 1.2-1). It is bounded to the east and west by areas permitted to the Golden Gate National Recreation Area, to the south by Marine Drive and former maintenance shops of Crissy Air Field on the Presidio of San Francisco and extends 400 ft by pier into the bay (figure 1.2-2). The station is located on 14.7 acres of land belonging to the U.S. Army. The facility consists of nine separate structures as described in table 1.2-1 and shown in figure 1.2-2. Of these, Buildings 991, 995, and 998 are not currently occupied or being used. Buildings 991, 992, and 993 underwent extensive rehabilitation from 1981 to 1983.

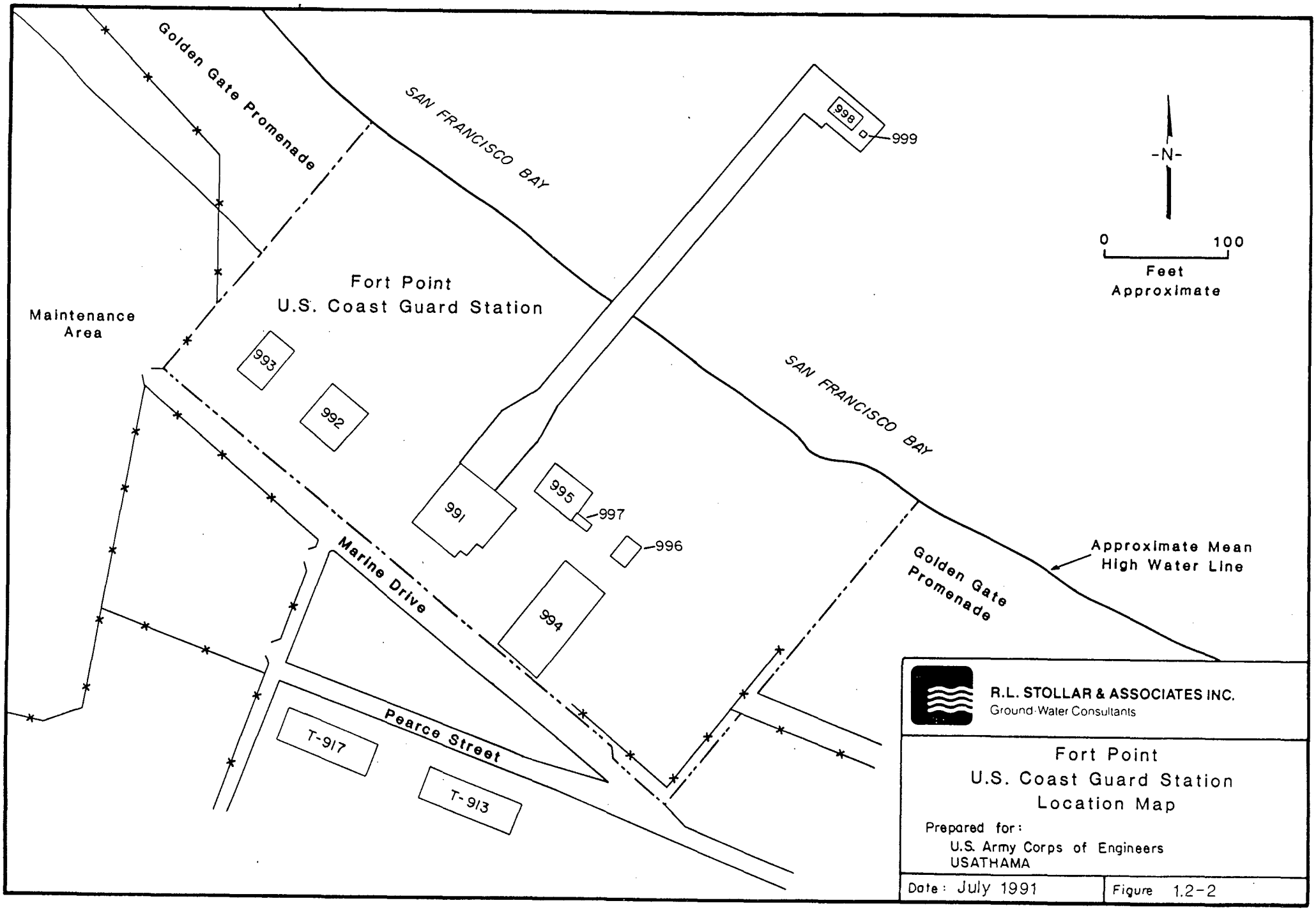

Golden Gate Promenade
SAN FRANCISCO BAY
998
999
-N-
0
100
Feet
Approximate
Fort Point
U.S. Coast Guard Station
Maintenance Area
993
992
991
995
997
996
994
SAN FRANCISCO BAY
Approximate Mean High Water Line
Golden Gate Promenade
Marine Drive
Pearce Street
T-917
T-913
R.L. STOLLAR & ASSOCIATES INC.
Ground-Water Consultants
Fort Point
U.S. Coast Guard Station
Location Map
Prepared for:
U.S. Army Corps of Engineers
USATHAMA
Date: July 1991
Figure 1.2-2

Table 1.2-1 Building Inventory, Fort Point U.S. Coast Guard Station

Building Number	Function	Area (square feet)
991	Station House	8,852
992	OIC Quarters	2,935
993	OIC Garage	2,000
994	Vehicle Hangar Building	3,913
995	Boat House	2,111
996	Electric Shop	500
997	Emergency Generator Building	108
998	Maintenance Shop on Pier	377
999	Tide Gaging Shack	109
	TOTAL	20,905

2.0 ASBESTOS SURVEY AND ASSESSMENT PROCEDURES

An asbestos survey and assessment of the FPUSCGS was conducted to locate, sample, and analyze potential ACM and to assess the current and future physical integrity of potential ACM. The survey and assessment was conducted by personnel with EPA certification as asbestos building inspectors (appendix C) as specified in the Code of Federal Regulations Title 40, Part 763 (40 CFR 763). If present, both friable and nonfriable potential ACM were identified and sampled. The survey was nondestructive in nature and did not involve removal of structural members such as walls or floors. As part of the planning process for the asbestos survey, a building survey was conducted and information on building uses were reviewed.

2.1 BUILDING SURVEY

Every functional space in each building was visually inspected to locate ACM, describe its application, and assess its friability and condition. For each building, the inspection began on the lowest level and progressed upward toward the roof. Friable and nonfriable potential ACM were divided into homogeneous areas and ACM survey data sheets (table 2.1-1) were completed for each area of suspected friable ACM. The procedures outlined in TM5-612 chapter 5, sections 5-2 and 5-3 were followed for surveying the various types of ACM encountered.

2.2 ACM ASSESSMENT

The Guide for Asbestos Hazard Assessment in U.S. Army Facilities (appendix B) was used to assess suspect ACM at FPUSCGS. As part of the building survey, several factors relating to the integrity of the suspected ACM were assessed. These factors include friability, physical condition, water damage, vibration/impact damage, quantity, occupant/user accessibility, area/building use, ACM application/use, and air plenum or direct air stream. Detailed descriptions of these conditions were recorded on the ACM survey data sheets. For each homogeneous area of friable suspect ACM, this information was used to complete the Army Friable Asbestos Assessment Checklist (table 2.2-1). This "assessment" procedure further evaluates the suspected ACM in terms of (1) its potential to be airborne, or the actual extent to which it is a source of airborne fibers (damage), and (2) to what extent humans in the area containing asbestos are exposed to airborne fibers. Numerical values for damage/risk and exposure were calculated from these assessment checklists and used to determine an assessment index (table 2.2-2). The assessment index for each homogeneous area of friable ACM was used to recommend management corrective action (table 2.2-3).

ACM SURVEY DATA SHEET

FACILITY: _____ BUILDING: _____ ROOM/AREA: _____ OPERATION: _____

EVALUATOR: _____ DATE: _____

ACM APPLIED TO:

☐ Ceiling

Type
- ☐ Concrete
- ☐ Tile
- ☐ Metal Deck
- ☐ Concrete Joists & Beams
- ☐ Corrugated Steel
- ☐ Suspended Metal Lathe
- ☐ Suspended Lay-in Panels
- ☐ Steel Beam or Bar Joists

Shape
- ☐ Flat ___
- ☐ Folded Plate ^^^
- ☐ Dome ∩
- ☐ Barrel ∩∩∩
- ☐ Other (draw)

☐ Pipe _____

INSULATION

	Loose fill	Blanket	Thermal Brick	Sheeting	Other
☐ Boiler					
☐ Tank					
☐ Ductwork					

☐ Structural members _____

☐ Wall _____

☐ Other _____
(Floortile, Shingles, Roofing Felt, Wall Board, Panel, etc.)

ENVIRONMENTAL CONDITIONS:

Type of floor ☐ Concrete ☐ Tile ☐ Wood ☐ Carpet ☐ Other _____

Type of lighting ☐ Surface ☐ Suspended ☐ Recessed

No. of Lights _____

Type of ventilation system _____

ACM debris on floor, furniture, equipment, or other surfaces _____

☐ No ☐ Yes If yes, describe _____

Confirmation bulk sample no. _____ Results _____

ACM is subject to direct air stream or is located in proximity to air plenum

☐ No ☐ Yes If yes, describe _____

Machinery or equipment in area ☐ No ☐ Yes

If yes, describe _____

SPECIAL CONSIDERATIONS:

Utility maintenance frequency _____

Life-cycle projection for structure _____

Renovation schedule (past, present, future - dates) _____

Utilization by public _____

Other unique characteristics _____

DESCRIPTION OF MATERIAL:

	Line	Pipe	Boiler	Tank	Ductwork	Structural	Walls	Other
Type of ACM								
[1] Sprayed-on [2] Troweled-on [3] Air Cell [4] Block Type [5] Cementitious [6] Other								
Sq. or linear feet								
Thickness (in.)								
Diameter (in.)								
No. of runs								
No. of fittings								
Condition: Good/Fair/Poor								
Friability: Low/Moderate/High								
Uniformity: Yes/No								
Water damage: Yes/No/Source								
Vibration damage: Yes/No/Source								
Adhesion to underlying surface: Good/Moderate/Poor								
Texture: Fibrous/Cementitious/ Granular/Concrete-like								
Is ACM covered? Yes/No/Describe Cloth, Paper, Paint, etc.								
Is covering uniform? Yes/No/Describe								
Bulk sample no. 1								
no. 2								
no. 3								
Type asbestos								
% Asbestos								
Other comments								

AREA OCCUPANT/USER ACCESSIBILITY:	NO	YES	DESCRIBE
Vulnerable to human activity			
Evidence of contact			
Material exposed			
Physical barriers			
User activities			

Table 2.1-1 ACM Survey Data Sheet

Table 2.2-1 Explanation of Categories and Scores Used in the Army Friable ACM Assessment

---

Physical Assess damage based on visible evidence of work surface accumulation or the condition of the sprayed-on or trowelled-on surface materials.

_____ (5) High - Dislodged pieced are evident on work surface.
_____ (4) Moderate - There is evidence of visible material fallout.
_____ (2) Low - There is some evidence of material fallout.
_____ (1) Minimal - There are isolated and very small areas of material damage or fallout.
_____ (0) None - No damage or evidence of any material fallout.

Water

_____ (3) Yes - Visible water damage.
_____ (0) No - No water damage.

Proximity to Items for Repair - If both A and B apply, score the one with the highest rating. (Check all that apply. Maximum of 3 points.) How far is the material from routine maintenance areas?

A. Sprayed-on or Trowelled-on: Could the material be damaged by routine maintenance?

_____ (3) < 1 ft or a ceiling panel contaminated with ACM must be removed.
_____ (2) 1 ≤? < 5 ft
_____ (1) ≥ 5 ft
_____ (0) ≥ 5 ft and no routine maintenance.

B. Pipe, Boiler, or Duct Insulation: Could damage occur as a result of routine maintenance?

_____ (3) A ceiling panel contaminated with ACM must be removed
_____ (1) Yes
_____ (0) No

Type of Material If area or room contains numerous categories of material, score the friable material with the largest area. Check all other categories that are found.

_____ (0-4) Other material, i.e., wallboard, ceiling tile, or floor tile with exposed friable ends, abrasions, etc.
_____ (1) Boiler and/or pipe
_____ (3) HVAC - Suspected ACM on exterior or ducts
_____ (4) Ceilings or Walls

Table 2.2-1 Explanation of Categories and Scores Used in the Army Friable ACM Assessment (continued)

Potential for Contact by Occupants How far is the friable sprayed-on, trowelled-on, or damaged material from the heads of the room or area occupants, regardless of whether there is a barrier? (High, medium, and low refer to the chance of the room or area personnel actually disturbing the ACM.)

<10 ft			≥10 ft		
_____	(8)	High	_____	(5)	High
_____	(5)	Medium	_____	(3)	Medium
_____	(2)	Low	_____	(0)	Low

Asbestos Content Use the percentage for the material that has the highest probability of becoming airborne.

_____ (1) $1 < \% \leq 30$
_____ (3) $30 < \% \leq 50$
_____ (5) $> 50\ \%$
_____ All bulk samples from the friable surface or damaged material(s) indicate no asbestos. If so, NO HAZARD.

Table 2.2-1 Explanation of Categories and Scores Used in the Friable ACM Assessment (continued)

Friable Defined by EPA: "hand pressure can crumble, pulverize, or reduce to powder when dry". Score the friability of the surface or damaged material.

_____ (6) High - Material is fluffy and/or the slightest hand pressure can dislodge it. A slight breeze may disperse the material.
_____ (3) Moderate - Material can be dislodged or scraped or crumbled by hand.
_____ (1) Low - Material is firmly bound, difficult to scrape off by hand.

Area of Visible Surface or Damaged Friable Material

_____ (0) $< 10\ ft^2$ These small areas should be repaired ASAP.
_____ (1) $10 \leq ft^2 < 100$
_____ (2) $100 \leq ft^2 < 1000$
_____ (3) $\geq 1000\ ft^2$

Surface Material Refers to the ability of the surface material to hold fibers for re-entrainment. If more than one type, score the roughest. If the material is exposed friable asbestos, score as rough.

_____ (4) Rough. Difficult to clean with a HEPA vacuum.
_____ (3) Pitted. Difficult to clean with a damp cloth but cleanable with a HEPA vacuum.
_____ (2) Moderate. Can be cleaned with a damp cloth.
_____ (1) Smooth. Easily cleaned with a damp cloth.

Ventilation Check all categories that apply. (Maximum 7 points)

_____ (5) The interior of the supply duct or plenum is coated or littered with friable material or is within 5 ft of a supply diffuser or fan and the condition of the material may result in fibers being entrained into the airflow.
_____ (2) The interior of the return air duct or plenum is coated or littered with friable material and is part of a recirculating system.
_____ (1) Air being supplied to the room or area is: (1) drawn from an area where the potential for asbestos fiber release is possible, or (2) part of a recirculating system where fibers may be drawn into the system.
_____ (0) None of the above applies.

Air Movement This refers to the general air movement in the room or area that may affect the friable surface or damaged material.

_____ (5) Material is subjected to routine turbulent or abrupt air movement.
_____ (2) Material is exposed to perceptible or occasional air streams.
_____ (0) No perceptible air flow in the room or area.

Table 2.2-1 Explanation of Categories and Scores Used in the Friable ACM Assessment (continued)

Activity Refers to forces acting on the surface covered, i.e., vibrational, water or steam, etc.

_____ (5) High - Friable surface or damaged material is subject to constant vibration (mechanical room).
_____ (2) Medium - Occasional vibration. (a warehouse where forklifts are used, next to an active runway, kitchen)
_____ (0) Low - Administrative office, library, classroom, storage room, stairway or corridor, waiting room, etc.

Floor

_____ (4) Carpet or an extremely rough surface difficult to clean by HEPA vacuum or by a damp cloth.
_____ (2) Seamed or rough surface (e.g., uncoated concrete)
_____ (1) Smooth continuous surface (e.g., finished or coated concrete,smoothly joined tile, etc.)
_____ (0-4) Unique situations (wood or dirt floors with varying degrees of smoothness).

Barriers If both A and B apply, score the one with the highest rating. Check all that apply. (Maximum of 4 points)

A. Refers to sprayed-on or trowelled-on material on ceiling or walls.

_____ (1) Suspended ceiling or accessible secondary wall.
_____ (2) Encapsulation or covered with nonasbestos material.
_____ (3) Railing or chicken wire.
_____ (4) None.

B. Pipe or boiler, duct, or other surface or damaged materials. Percent of total exposed and visible to the occupants.

_____ (1) $\leq 25\%$
_____ (2) $25 < \% \leq 50$
_____ (3) $50 < \% \leq 75$
_____ (4) $75 < \% \leq 100$

Table 2.2-1 Explanation of Categories and Scores Used in the Friable ACM Assessment (continued)

Population(Pop) This involves defining the average occupancy and outside visitor traffic (do not count visitors from within the building) of a room or area based on an 8 hour per day exposure. For example, a reception area in a shop normally has 15 individuals assigned to the office. They see approximately 240 customers from outside the building over an 8 hour day. Each customer is serviced and gone within 30 minutes.

([240 persons X 0.5 hours]/8 hours) + 15 occupants = 30

This would score as 2

_____ (1) ≤ 9 or for corridors
_____ (2) 10 ≤ Pop ≤ 200
_____ (3) 201 ≤ Pop ≤ 500
_____ (4) 501 ≤ Pop ≤ 1000
_____ (5) ≥ 1001 for medical facilities, youth centers, child care facilities or residential buildings, regardless of the population.

Table 2.2-2 Determination of Assessment Index

Using the Damage/Risk and Exposure values derived from the Army Friable ACM Assessment checklists (table 2.2-1), enter the matrix below and find the corresponding assessment index.

		Exposure (4 < E < 43)			
		43-26	25-17	16-8	7-4
Damage Risk (1 < D < 28)	28-17	A	A	A	B
	16-11	A	B	C	D
	10-5	A	B	C	E
	4-1	A	C	D	F

Each assessment index represents a given set of "Recommended Management Corrective Actions" described in table 2.2-3.

Table 2.2-3 Explanation of Assessment Indices

Assessment Index	Recommended Management Corrective Actions
A	Immediate Action - Requires assessment by accredited personnel* (in-house or contractor) who are experienced in and qualified to conduct asbestos assessments. Possible follow-up actions may include isolation of the area and the restriction of access and/or immediate removal of the ACM. If removal is indicated, action planning should include a detailed survey. This condition will likely involve a near-term expenditure of funds. Managers must know exactly what needs to be done to eliminate the asbestos hazard and how to use available funds most effectively.
B	Action as Soon as Possible - Requires assessment by accredited personnel* (in-house or contractor) who are experienced in and qualified to conduct asbestos assessments. Initiate a Special O & M** program immediately. Possible follow-up actions may include the limiting of access to the area and the scheduling of removal during periods of low activity in the facility, not waiting for the normal repair and maintenance cycle.
C	Planned Action - Requires assessment by accredited personnel* (in-house or contractor) who is experienced in and qualified to conduct asbestos assessments. Initiate a Special O & M** program. Removal should be scheduled as part of the normal repair and maintenance cycle of a facility, minimizing cost and disturbance.
D	Repair - Initiate Special O & M** using accredited personnel*. Damaged areas should be repaired, where "repair" means returning damaged ACBM to an undamaged condition or to an intact state so as to contain fiber release. Schedule removal when practical and cost effective. Take preventative measures to reduce further damage.
E	Monitoring - Continue Special O & M** using accredited personnel*. Take steps to prevent damage to the ACMB or other ACM. Monitor frequently the condition of all ACM.
F	No Immediate Action - Continue Special O & M** using accredited personnel* until major renovation or demolition requires removal or until assessment factors change.

* Accredited personnel are industrial hygienists (American Board of Industrial Hygiene (ABIH) certified or who meet the Office of Personnel Management's 0690 classification standard) and other trained persons with a minimum of 1 year experience in asbestos assessment activities and who are accredited in the specific area they will be responsible for (inspector management planner, abatement designer, contractor, supervisor, and abatement worker) as specified in Section 206 of Title II of TSCA.

** An O & M program may include enclosure and encapsulation, where appropriate, to increase effectiveness.

2.3 BULK SAMPLING

Bulk sampling was conducted following guidance outlined in TM5-612, chapter 5, section 5-3.d. Sample identification, labeling, custody, and shipping procedures specified in the Quality Assurance Plan for the Presidio of San Francisco, Remedial Investigation and Feasibility Study were followed. Samples were analyzed using polarized light microscopy (PLM) by Versar, Inc. in Springfield, Virginia. This laboratory is USATHAMA-approved and has met criteria defined in the Proficiency Analytical Testing (PAT) Program described in detail in TM5-612, appendix E, section E-2.c.

Bulk asbestos samples were analyzed by trained microscopists, using Polarized Light Microscopy with dispersion staining. Quantitation was performed through visual estimates. The accuracy of estimates varies depending on the nature of each sample, but is generally ±10 percent or better. Analysts were trained by McCrone Research Institute utilizing the EPA Interim Method for the Determination of Asbestos in Bulk Insulation Samples. Versar's procedures for calculating the concentration of asbestos in samples is further detailed in excerpts from Versar's Asbestos Standard Operating Procedure (SOP) included in appendix D.

Quality control (QC) samples were collected in accordance with TM5-612, section 5-2.d(5)(c), to confirm the results of the laboratory analyzing the bulk samples. QC samples consisted of duplicate samples taken from an area abutting the regular bulk sample. QC samples were sent to the same lab as regular samples for analysis using the same methods. The lab was not informed as to which samples were duplicates. Seven of the 96 samples collected, or 8 percent, were QC samples. As a standard practice, at least one QC sample was collected from each building or one sample per 20 bulk samples, whichever was larger. Internal asbestos laboratory QC procedures utilized by Versar, Inc. are included in appendix D.

3.0 ASBESTOS SURVEY, ASSESSMENT, AND SAMPLE ANALYSIS RESULTS

The results of the asbestos survey and bulk sampling are discussed in the following sections by building. ACM Survey Data Sheets, Friable Asbestos Assessment and lab reports are presented in appendix E.

3.1 BUILDING 991

Building 991 is the former station house, a four-story, wood-frame structure with wood shake siding and roof, and has been recently reoccupied. A total of 75 functional areas including 55 rooms and closets, one crawl space, and 19 functional areas above ceiling panels were inspected. A total of 37 samples were collected, including 15 friable (table 3.1-1) and 22 nonfriable (table 3.1-2) samples, and sent to Versar for analysis. Figures 3.1-1 through 3.1-4 illustrate room and sample locations on each level. None of the friable samples collected tested positive for asbestos while one nonfriable sample tested positive. This sample, CGA-032, was a piece of linoleum floor material from the laundry room (Room 28, figure 3.1-2) and it contained 20 to 25 percent chrysotile asbestos. This particular type of floor material was found only in Room 28.

3.2 BUILDING 992

Building 992 is the Officer in Charge's (OIC's) residence, a two-story, wood-frame structure with wood shake siding and roof. A total of 29 functional areas including: 23 rooms and closets, one cellar, one crawl space, one attic, two functional areas above a false kitchen ceiling and a bedroom closet, and one enclosed stairwell used as an air plenum were inspected. A total of 21 samples were collected, 18 friable (table 3.2-1) and three nonfriable (table 3.2-2), and sent for analysis. Figures 3.2-1 through 3.2-4 show room and sample locations for each level. Five of the friable samples tested positive while none of the nonfriable samples tested positive for asbestos.

Samples testing positive for asbestos were CGA-063, CGA-065, CGA-066, CGA-067, and CGA-091. Samples CGA-063, CGA-066, and CGA-067 were from duct wrap found in the attic and in the crawl space. Sample CGA-063 contained 50-55 percent chrysotile asbestos while samples CGA-066 and CGA-067 contained 25-30 percent chrysotile asbestos. This type of duct wrap was observed only in the attic and crawlspace. However, it is suspected that the ductwork is present in other, inaccessible spaces within the structure.

Sample CGA-065, collected on the second floor in Room 16 (figure 3.2-3), contained plaster which is present on the walls and ceilings of many of the rooms in the house. The sample also contained joint compound which is locally present around electrical fixtures. Analysis indicates 1-5 percent chrysotile asbestos in this sample. Asbestos was contained entirely within the joint compound while

Table 3.1-1 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 991, Friable Materials

Sample CGA No.	Assess Form No.	Bldg No.	Floor No.	Room No.	Function	Room No.s	DAMAGE OR RISK						
							Phys Dmg	Wtr Dmg	Prox/ Repair	Mat'l Type	Cont Pot.	Asb Cont	Dmg Total
30	7	991	1	23	Wall/sheetrock	Most	1	0	0	4	2	None	7
44	7	991	3	42	Wall/sheetrock	Most	1	0	0	4	2	None	7
15	7	991	1	4	Wall/sheetrock	Most	1	0	0	4	2	None	7
16	8	991	1	4	Ceiling panel	See #1 below	1	3	3	4	2	None	13
27	8	991	1	13	Ceiling panel	See #1 below	1	3	3	4	2	None	13
33	8	991	2	26	Ceiling panel	See #1 below	1	3	3	4	2	None	13
18	8	991	1	9	Ceiling panel	See #1 below	1	3	3	4	2	None	13
37	8	991	2	26A	Ceiling panel	See #1 below	1	3	3	4	2	None	13
19	9	991	1	9	Ceiling panel	9,12,26,31	1	0	3	4	2	None	10
28	10	991	1	13A	Duct wrap	See #2 below	2	0	1	3	2	None	8
29	11	991	1	13A	Pipe insulation	See #2 below	1	0	1	1	2	None	5
34	11	991	2	27	Pipe insulation	See #3 below	1	0	1	1	2	None	5
42	12	991	3	51	Batt insulation	43,47,50,51	1	0	0	4	2	None	7
20	13	991	1	10	Ceiling tile	10,52	0	0	0	4	2	None	6
45	13	991	4	52	Ceiling tile	10,52	0	0	0	4	2	None	6

#1 4,7,9,11,12,13,14,15,17,19,23,26,26A,29,31,33,35,37,39

#2 4,7,9,11,11A,12,13,14,15,17,19,23,26A,31,33,35,37,39

#3 4,7,12,13,19,23,26A,27,29,33,35,37,39

Detailed explanations of "Damage or Risk" and "Exposure" categories and associated numerical ratings included in table 2.2-1.

Explanation:

PHYS DMG = Physical Damage
WTR DMG = Water Damage
PROX/REPAIR = Proximity to Items for Repair
MAT'L TYPE = Type of Material
CONT POT = Potential for Contact by Occupants
ASB CONT = Asbestos Content
DMG TOTAL = Damage Total
FLOOR = Floor
POP = Population

FRIAB = Friability
AREA VIS = Area of Visible Surface or Damaged Friable Material
WALLS = Surface Material
VEN = Ventilation
AIR MVT = Air Movement
ACT = Activity
BARR = Barriers
EXP TOTAL = Exposure Total

Table 3.1-1 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 991, Friable Materials (continued)

Sample CGA No.	Assess Form No.	Bldg No.	Floor No.	Room No.	Function	Room No.s	EXPOSURE Friab	Area Vis	Walls	Ven	Air Mvt	Act	Floor	Barr	Pop	Exp Total
30	7	991	1	23	Wall/sheetrock	Most	1	3	1	1	2	0	4	1	2	15
44	7	991	3	42	Wall/sheetrock	Most	1	3	1	1	2	0	4	1	2	15
15	7	991	1	4	Wall/sheetrock	Most	1	3	1	1	2	0	4	1	2	15
16	8	991	1	4	Ceiling panel	See #1 below	3	3	1	0	2	0	4	4	2	19
27	8	991	1	13	Ceiling panel	See #1 below	3	3	1	0	2	0	4	4	2	19
33	8	991	2	26	Ceiling panel	See #1 below	3	3	1	0	2	0	4	4	2	19
18	8	991	1	9	Ceiling panel	See #1 below	3	3	1	0	2	0	4	4	2	19
37	8	991	2	26A	Ceiling panel	See #1 below	3	3	1	0	2	0	4	4	2	19
19	9	991	1	9	Ceiling panel	9,12,26,31	3	3	1	0	2	0	4	4	2	19
28	10	991	1	13A	Duct wrap	See #2 below	6	3	1	1	2	2	4	4	2	25
29	11	991	1	13A	Pipe insulation	See #2 below	6	3	1	0	2	2	4	1	2	21
34	11	991	2	27	Pipe insulation	See #3 below	6	3	1	0	2	2	4	1	2	21
42	12	991	3	51	Batt insulation	43,47,50,51	6	3	1	0	2	2	4	1	2	21
20	13	991	1	10	Ceiling tile	10,52	3	2	1	0	2	0	4	4	2	18
45	13	991	4	52	Ceiling tile	10,52	3	2	1	0	2	0	4	4	2	18

Detailed explanations of "Damage or Risk" and "Exposure" categories and associated numerical ratings included in table 2.2-1.

Explanation:

PHYS DMG = Physical Damage
WTR DMG = Water Damage
PROX/REPAIR = Proximity to Items for Repair
MAT'L TYPE = Type of Material
CONT POT = Potential for Contact by Occupants
ASB CONT = Asbestos Content
DMG TOTAL = Damage Total
FLOOR = Floor
POP = Population

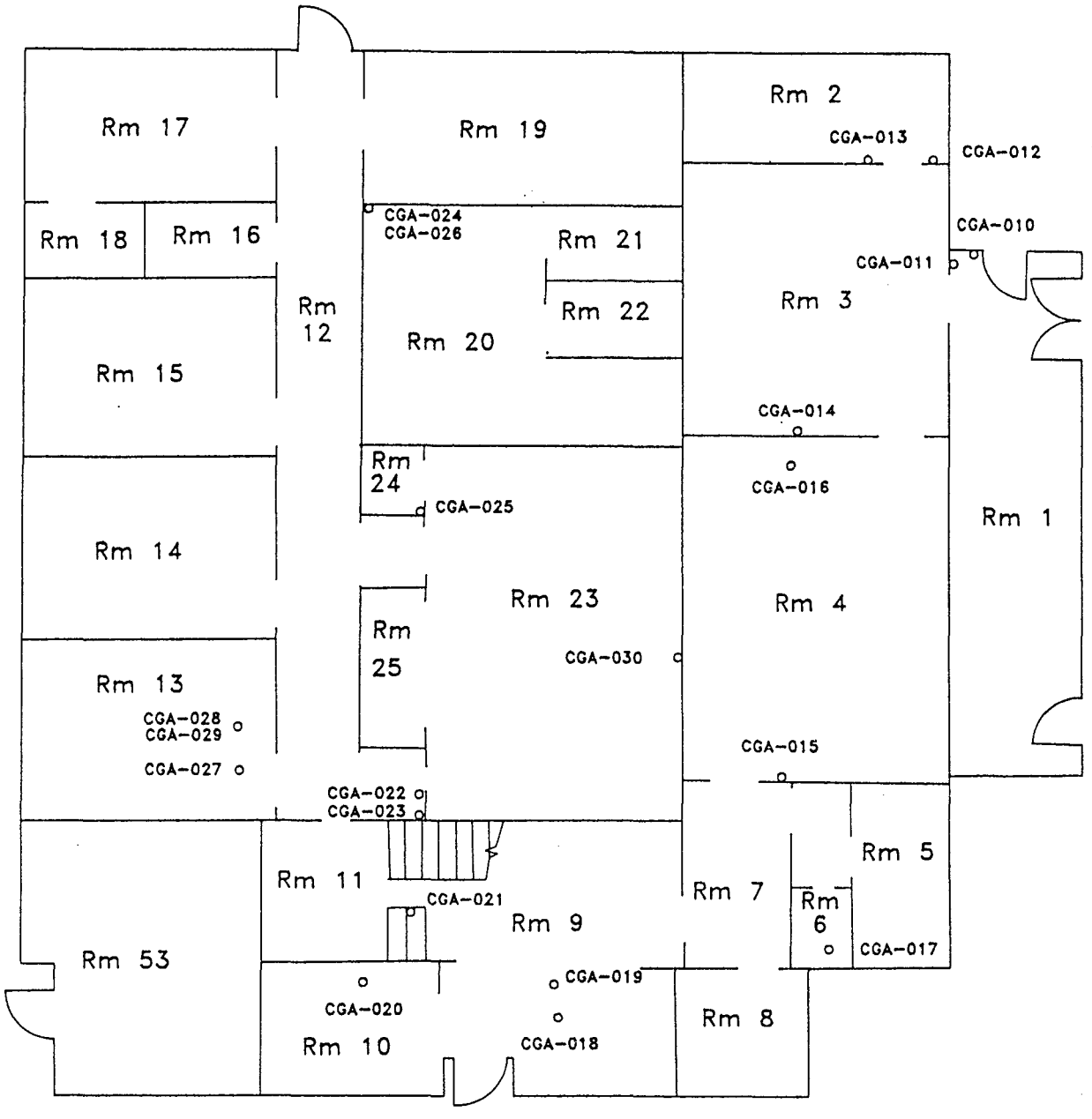
FRIAB = Friability
AREA VIS = Area of Visible Surface or Damaged Friable Material
WALLS = Surface Material
VEN = Ventilation
AIR MVT = Air Movement
ACT = Activity
BARR = Barriers
EXP TOTAL = Exposure Total

Table 3.1-2 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 991, Nonfriable Material

Sample CGA No.	Floor No.	Room No.	Function	Room No.s Where Present	Friability	Asbestos Content
40B	3	44	Baseboard mastik	See #1 below	Nonfriable material	None
14	1	3	Ceramic floor tile	3	Nonfriable material	None
39	3	44	Drywall texture	44	Nonfriable material	None
11	1	1	Flex baseboard	See #1 below	Nonfriable material	None
13	1	2	Flex baseboard	See #1 below	Nonfriable material	None
22	1	12	Flex baseboard	See #1 below	Nonfriable material	None
26	1	20	Flex baseboard	See #1 below	Nonfriable material	None
40A	3	44	Flex baseboard	See #1 below	Nonfriable material	None
41	3	44	Flex baseboard	See #1 below	Nonfriable material	None
12	1	2	Floor tile	2	Nonfriable material	None
17	1	6	Floor tile	6	Nonfriable material	None
24	1	20	Floor tile	20	Nonfriable material	None
25	1	24	Floor tile	24	Nonfriable material	None
35	2	27	Floor tile	27	Nonfriable material	None
43	3	49	Floor tile	49	Nonfriable material	None
10	1	1	Floor/sheet linoleum	1,4	Nonfriable material	None
32	2	28	Floor/sheet linoleum	28	Nonfriable material	1
21	1	9	Stairs/sheet linoleum	Stairs	Nonfriable material	None
38	3	41	Stairs/sheet linoleum	Stairs	Nonfriable material	None
23	1	12	Vinyl wall covering	12	Nonfriable material	None
31	2	28	Vinyl wall covering	28	Nonfriable material	None
36	2	28	Vinyl wall covering	28	Nonfriable material	None

Explanation: #1 = 1, 2, 6, 12, 18, 20, 24, 27, 44, 49

Asbestos Content-
1- 1-30%
3- 31-50%
5- >50%
No hazard- None



EXPLANATION

o ASBESTOS SAMPLE LOCATION

N

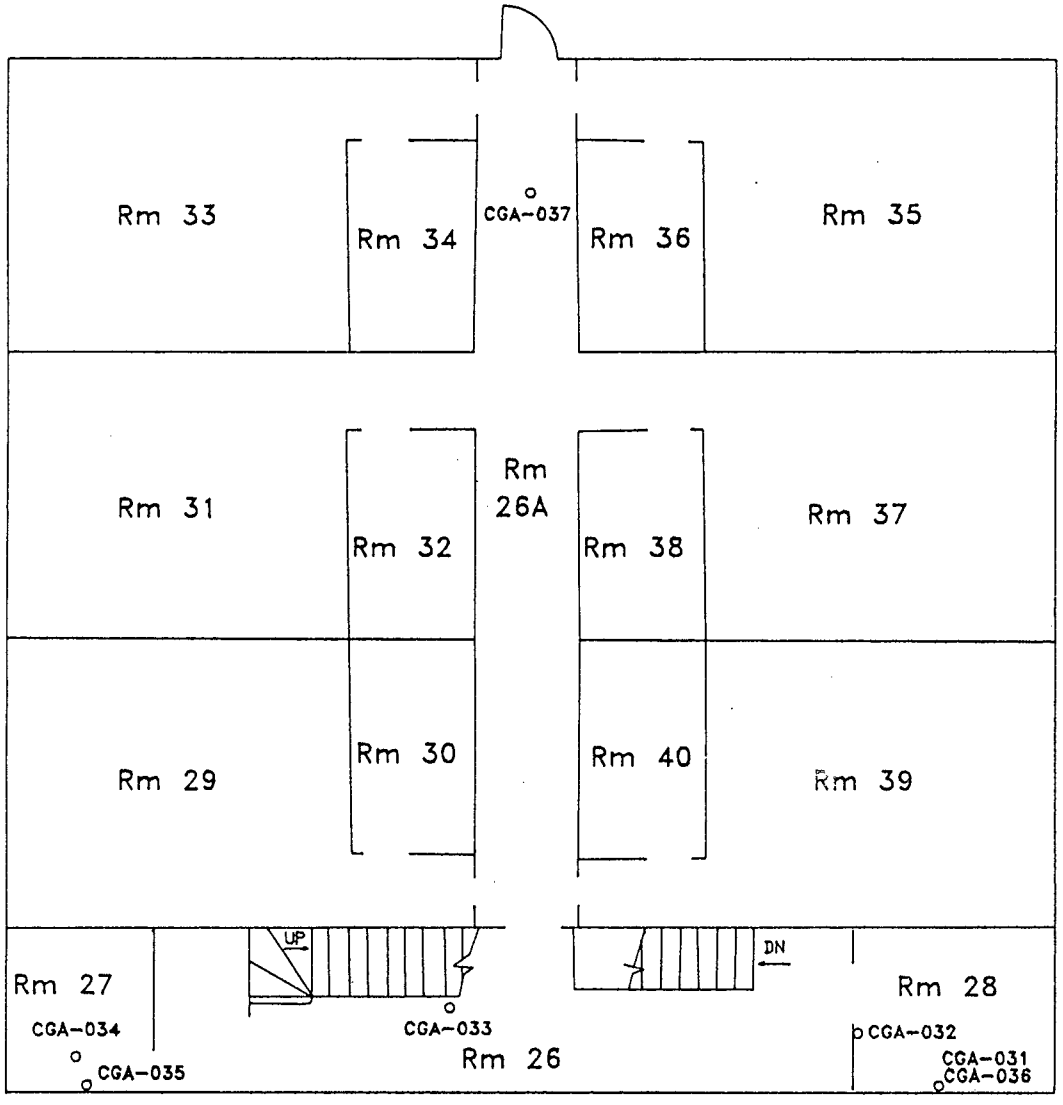
0 5 10 15

FEET

R.L. STOLLAR & ASSOCIATES INC.
Ground-Water Consultants

FLOOR PLAN & SAMPLE LOCATIONS
BLDG 991, FIRST FLOOR
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.1-1



EXPLANATION

o ASBESTOS SAMPLE LOCATION

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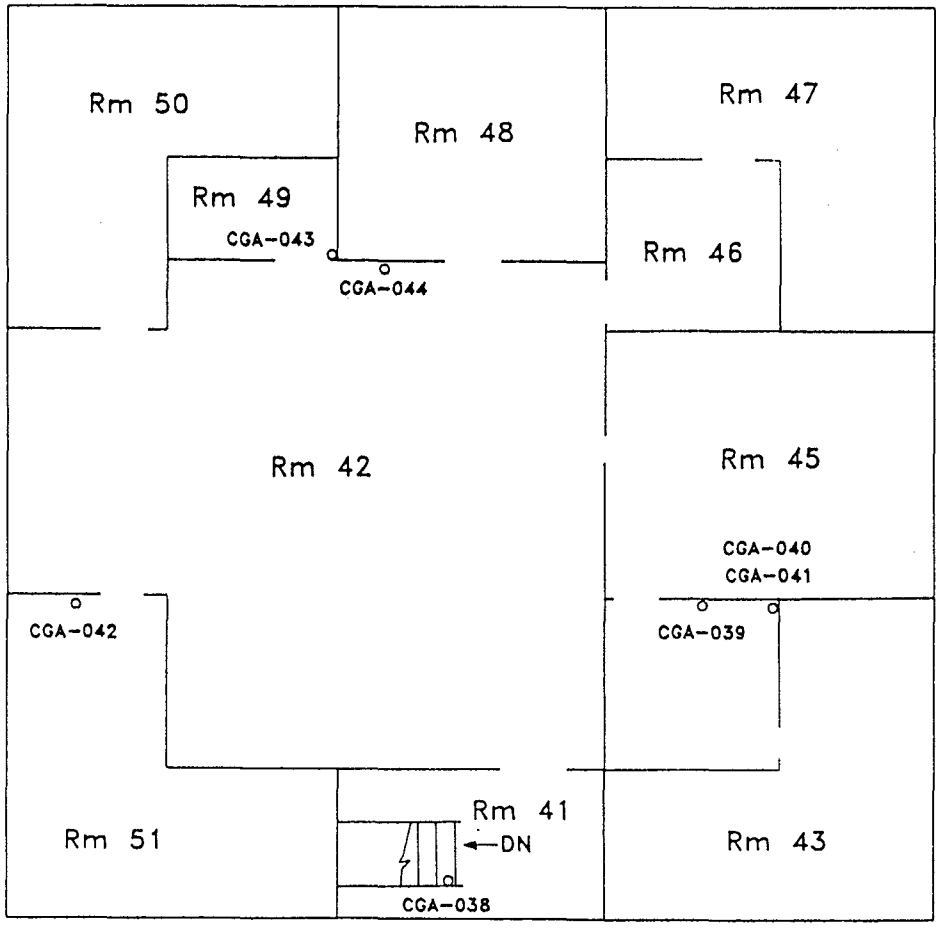
0 5 10 15

FEET

R.L. STOLLAR & ASSOCIATES INC.
Ground-Water Consultants

FLOOR PLAN & SAMPLE LOCATIONS
BLDG 991, SECOND FLOOR
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.1-2



EXPLANATION

o ASBESTOS SAMPLE LOCATION

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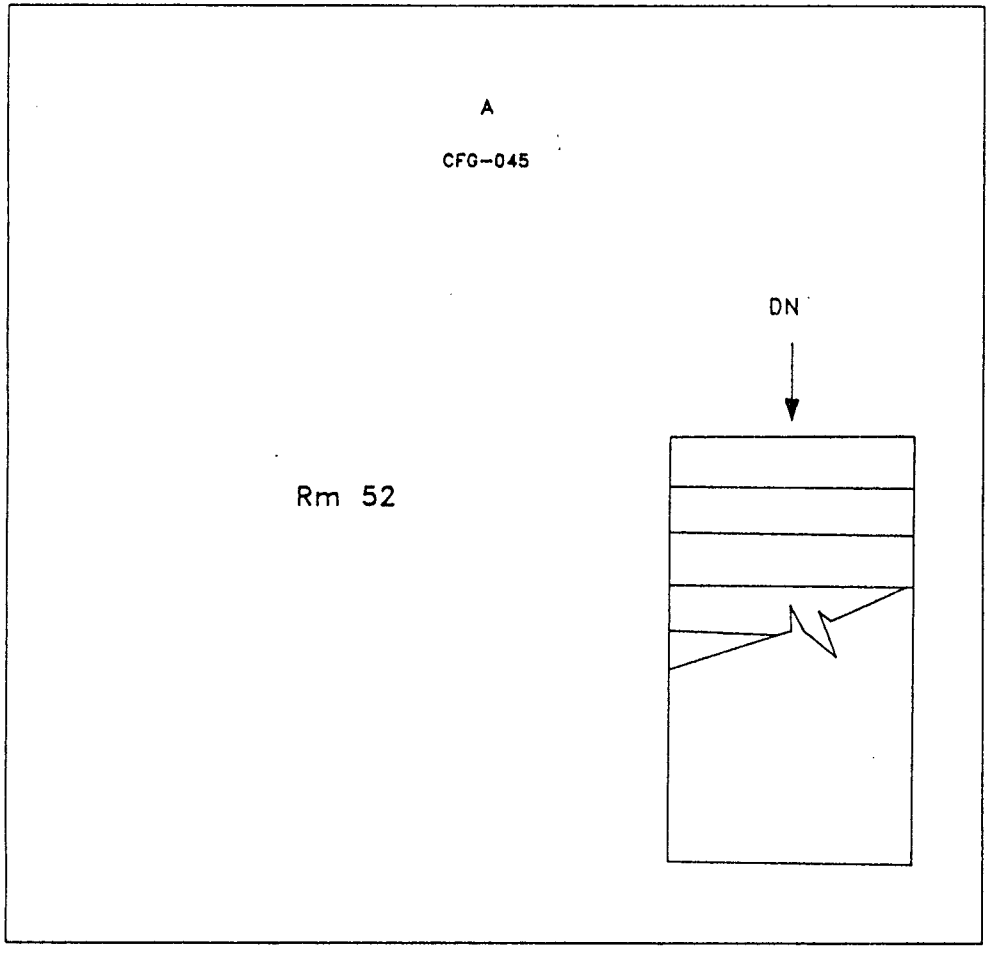
FEET

R.L. STOLLAR & ASSOCIATES INC.
Ground-Water Consultants

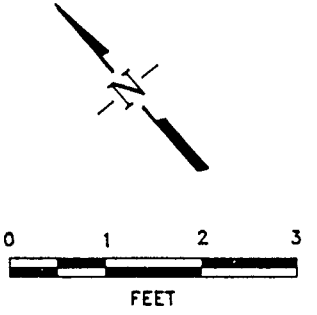
FLOOR PLAN & SAMPLE LOCATIONS
BLDG 991, THIRD FLOOR
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.1-3



EXPLANATION

A ASBESTOS SAMPLE LOCATION



R.L. STOLLAR & ASSOCIATES INC.
Ground-Water Consultants

FLOOR PLAN & SAMPLE LOCATIONS
BLDG 991, LOOKOUT TOWER
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.1-4

Table 3.2-1 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 992, Friable Materials

Sample CGA No.	Assess Form No.	Floor No.	Room No.	Function	Room No.s	DAMAGE OR RISK						
						Phys Dmg	Wtr Dmg	Prox/ Repair	Mat'l Type	Cont Pot.	Asb Cont	Dmg Total
59	19	1	2	Blown insulation	2,13A,24	5	0	1	4	0	None	10
64	19	Attic	24	Blown insulation	2,13A,24	5	0	1	4	0	None	10
62	21	2	13A	Duct wrap	See #5 below	2	0	3	1	5	None	11
69	24	Bsmt	26	Duct wrap	26	5	0	1	2	8	None	16
70	24	Bsmt	26	Duct wrap	26	5	0	1	2	8	None	16
58	18	1	2	Lath coating	2,5A,13A	5	0	2	2	2	None	11
61	18	2	13A	Lath plaster	2,5A,13A	5	0	2	2	2	None	11
57	18	1	2	Lath plaster	2,5A,13A	5	0	2	2	2	None	11
63	22	Attic	24	Paper duct wrap	Crawl, attic, 13A	4	0	3	3	0	5	15
66	22	Crawl	25	Paper duct wrap	Crawl, attic, 13A	4	0	3	3	0	5	15
67	22	Crawl	25	Paper duct wrap	Crawl, attic, 13A	4	0	3	3	0	5	15
68	23	Bsmt	26	Sheet insulation	Cellar	5	0	1	3	8	None	17
60	20	1	3	Wall plaster	See #4 below	1	0	0	0	2	None	3
88	20	1	3	Wall plaster	See #4 below	1	0	0	0	2	None	3
89	20	1	7	Wall plaster	See #4 below	1	0	0	0	2	None	3
65	20	2	16	Wall plaster	See #4 below	1	0	0	0	2	1	4
91	20	2	16	Wall plaster	See #4 below	1	0	0	0	2	1	4
90	20	2	20	Wall plaster	See #4 below	1	0	0	0	2	None	3

#4 3,4,6,7,8,12,14,15,16,17,18,19,20,21,22

#5 Furnace room, crawlspace, 13A

Detailed explanations of "Damage or Risk" and "Exposure" categories and associated numerical ratings included in table 2.2-1.

Explanation:

PHYS DMG = Physical Damage
WTR DMG = Water Damage
PROX/REPAIR = Proximity to Items for Repair
MAT'L TYPE = Type of Material
CONT POT = Potential for Contact by Occupants
ASB CONT = Asbestos Content
DMG TOTAL = Damage Total
FLOOR = Floor
POP = Population
FRIAB = Friability
AREA VIS = Area of Visible Surface or Damaged Friable Material
WALLS = Surface Material
VEN = Ventilation
AIR MVT = Air Movement
ACT = Activity
BARR = Barriers
EXP TOTAL = Exposure Total

Table 3.2-1 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 992, Friable Materials (continued)

Sample CGA No.	Assess Form No.	Floor No.	Room No.	Function	Room No.s	EXPOSURE									
						Friab	Vis	Area Walls	Ven	Mvt	Air Act	Floor	Barr	Pop	Exp Total
59	19	1	2	Blown insulation	2,13A,24	6	1	3	0	0	0	2	1	1	14
64	19	Attic	24	Blown insulation	2,13A,24	6	1	3	0	0	0	2	1	1	14
62	21	2	13A	Duct wrap	See #5 below	6	0	1	5	2	4	1	1	1	21
69	24	Bsmt	26	Duct wrap	26	6	0	1	1	2	5	1	4	1	21
70	24	Bsmt	26	Duct wrap	26	6	0	1	1	2	5	1	4	1	21
58	18	1	2	Lath coating	2,5A,13A	3	0	4	0	0	2	1	1	1	12
61	18	2	13A	Lath plaster	2,5A,13A	3	0	4	0	0	2	1	1	1	12
57	18	1	2	Lath plaster	2,5A,13A	3	0	4	0	0	2	1	1	1	12
63	22	Attic	24	Paper duct wrap	Crawl, attic, 13A	3	2	2	5	2	2	3	1	1	21
66	22	Crawl	25	Paper duct wrap	Crawl, attic, 13A	3	2	2	5	2	2	3	1	1	21
67	22	Crawl	25	Paper duct wrap	Crawl, attic, 13A	3	2	2	5	2	2	3	1	1	21
68	23	Bsmt	26	Sheet insulation	Cellar	6	0	1	1	2	5	1	1	1	18
60	20	1	3	Wall plaster	See #4 below	1	0	2	0	2	0	4	2	1	12
88	20	1	3	Wall plaster	See #4 below	1	0	2	0	2	0	4	2	1	12
89	20	1	7	Wall plaster	See #4 below	1	0	2	0	2	0	4	2	1	12
65	20	2	16	Wall plaster	See #4 below	1	0	2	0	2	0	4	2	1	12
91	20	2	16	Wall plaster	See #4 below	1	0	2	0	2	0	4	2	1	12
90	20	2	20	Wall plaster	See #4 below	1	0	2	0	2	0	4	2	1	12

Detailed explanations of "Damage or Risk" and "Exposure" categories and associated numerical ratings included in table 2.2-1.

Explanation:

PHYS DMG = Physical Damage
WTR DMG = Water Damage
PROX/REPAIR = Proximity to Items for Repair
MAT'L TYPE = Type of Material
CONT POT = Potential for Contact by Occupants
ASB CONT = Asbestos Content
DMG TOTAL = Damage Total
FLOOR = Floor
POP = Population

FRIAB = Friability
AREA VIS = Area of Visible Surface or Damaged Friable Material
WALLS = Surface Material
VEN = Ventilation
AIR MVT = Air Movement
ACT = Activity
BARR = Barriers
EXP TOTAL = Exposure Total

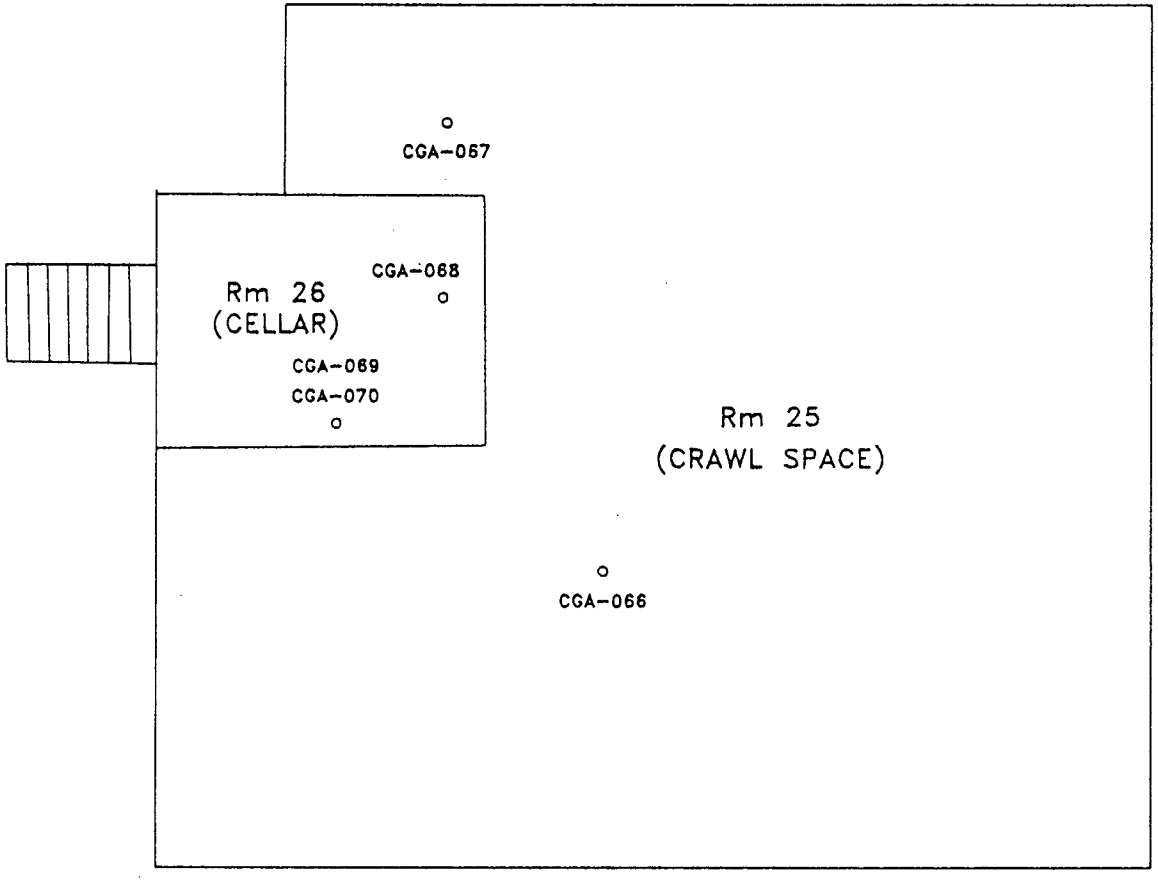
Table 3.2-2 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 992, Nonfriable Material

Sample CGA No.	Floor No.	Room No.	Function	Room No.s Where Present	Friability	Asbestos Content
92	2	23	Floor/sheet linoleum	23, 9	Nonfriable material	None
93	1	2	Floor/sheet linoleum	2	Nonfriable material	None
94	1	1	Floor/sheet linoleum	1	Nonfriable material	None

Explanation:

Asbestos Content

1- 1-30%
3- 31-50%
5- >50%
No hazard- None



EXPLANATION

o ASBESTOS SAMPLE LOCATION

N

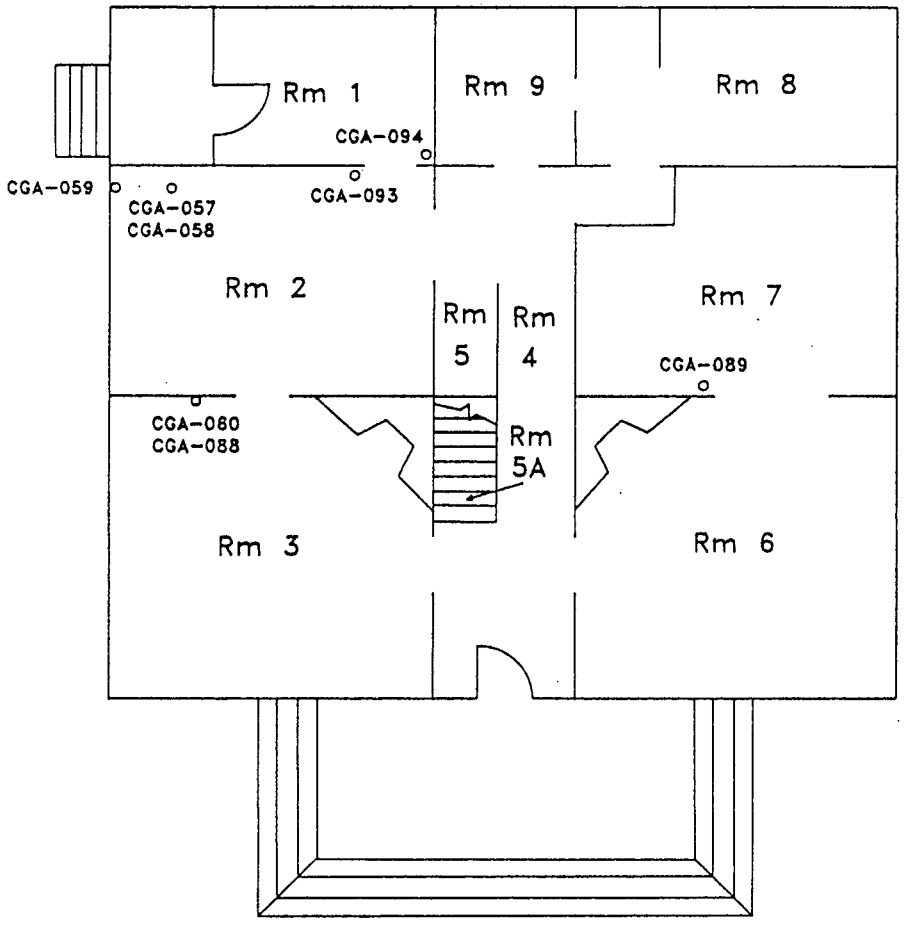
0 4 8 12

FEET

R.L. STOLLAR & ASSOCIATES INC.
Ground-Water Consultants

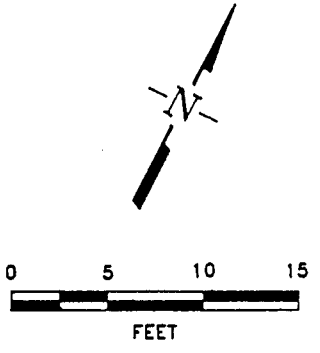
FLOOR PLAN & SAMPLE LOCATIONS
BLDG 992, CELLAR
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.2-1



EXPLANATION

o ASBESTOS SAMPLE LOCATION



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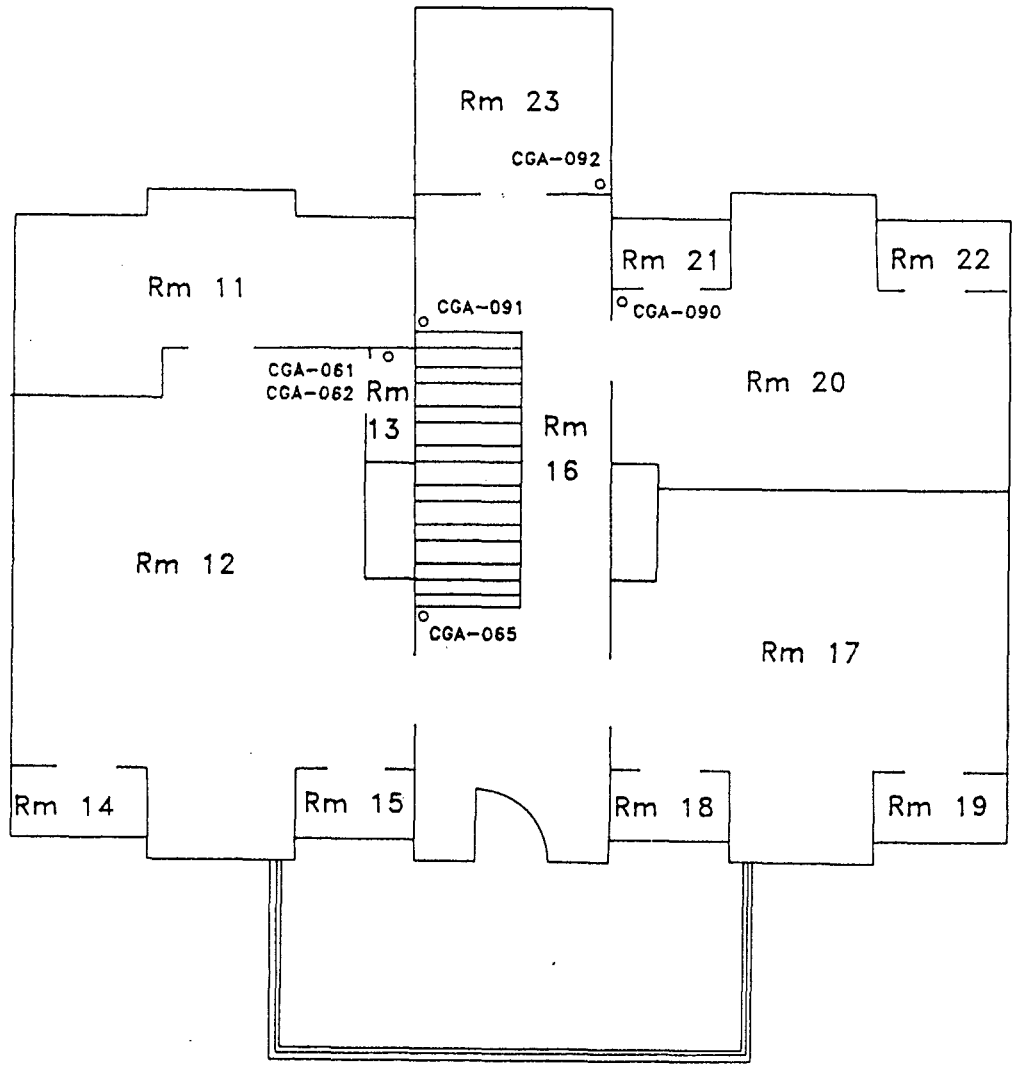
Ground-Water Consultants

FLOOR PLAN & SAMPLE LOCATIONS
BLDG 992, FIRST FLOOR
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

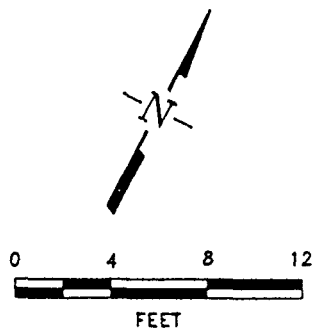
Date: July 1991

Figure 3.2-2



EXPLANATION

o ASBESTOS SAMPLE LOCATION



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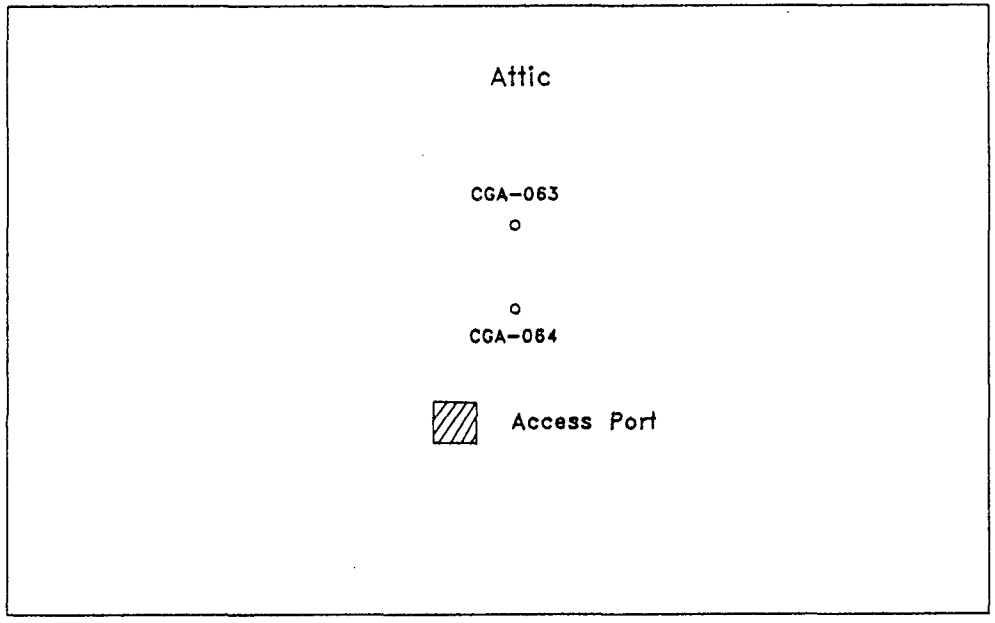
Ground-Water Consultants

FLOOR PLAN & SAMPLE LOCATIONS
BLDG 992, SECOND FLOOR
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.2-3



EXPLANATION

o ASBESTOS SAMPLE LOCATION

N

0 4 8 12

FEET

R.L. STOLLAR & ASSOCIATES INC.
Ground-Water Consultants

FLOOR PLAN & SAMPLE LOCATIONS
BLDG 992, ATTIC
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991

Figure 3.2-4

no asbestos was detected in the plaster for this sample (pers. comm., Marcie Wilson, Asbestos Lab Manager, Versar). Another sample collected in Room 16 (CGA-091) also contains plaster and joint compound. Again, no asbestos was detected in the plaster while 1-5 percent chrysotile asbestos was noted in the joint compound. Four additional samples of the wall material were collected and identified by the lab as plaster (CGA-060, CGA-088, and CGA-089) and drywall (CGA-090). No asbestos was noted in these four samples.

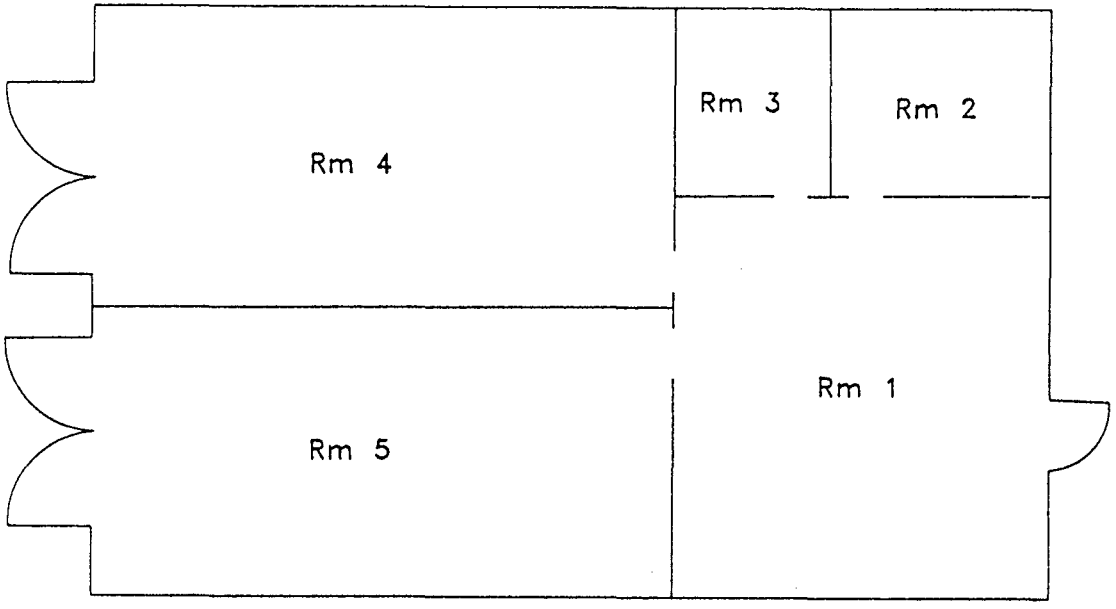
The precise construction of the walls in Building 992 is unclear at this time. At the time of inspection it was determined that all the walls and ceilings in Rooms 3, 4, 6, 7, 8, 12, and 14 through 22 were composed of lath plaster. However, lab analysis and floor plans made available to RLSA subsequent to the survey indicate that at least some of the walls in Rooms 7, 8, 12, 16, 17, and 20 were replaced with gypsum board and coated with a skim coat to simulate the plaster appearance. Joint compound is commonly used as a skim coat and may have been used for this application in Building 992. Conversations with U.S. Coast Guard personnel indicate that no record exists as to the exact nature of the skim coat applied in this building. If the joint compound that yielded the asbestos detections was also used as the skim coat, the extent of this compound is considerably larger than if it were used only around joints and fixtures.

3.3 BUILDING 993

Building 993 is the OIC's garage, a one-story, wood-frame structure with wood shake siding and roof. No suspect ACM were observed during inspection of this building; therefore, no samples were collected. Figures 3.3-1 and 3.3-2 illustrate the layout of the garage and its attic area.

3.4 BUILDING 994

Building 994, a one-level structure with metal siding and roof, is referred to as a vehicle hanger. The building is currently occupied and used for various maintenance operations and parachute repair. A total of nine functional areas including: eight rooms and closets, and one functional area above Room 1 were inspected. A total of 14 samples were collected, nine friable (table 3.4-1) and five nonfriable (table 3.4-2), and sent to Versar for analysis. Figure 3.4-1 illustrates room and sample locations for Building 994. Three of the friable samples (CGA-049, CGA-52B, and CGA-074D) tested positive while two of the nonfriable samples (CGA-046A and CGA-046B) tested positive for asbestos. Sample CGA-052, initially taken for a Sheetrock sample, was split at the lab into Sheetrock (CGA-052A) and Sheetrock joint compound (CGA-052B). No asbestos was detected in the Sheetrock while the joint compound was analyzed as having less than 1 percent chrysotile asbestos. Sample CGA-074D, taken at the same location as CGA-052 also contained both joint compound and Sheetrock. Laboratory analysis indicates 1-5 percent chrysotile asbestos in that sample. The lab bench sheets for this sample indicate that the asbestos was observed only in the joint compound (pers. comm., Marcie Wilson,



EXPLANATION

o ASBESTOS SAMPLE LOCATION

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0 4 8 12

FEET

R.L. STOLLAR & ASSOCIATES INC.
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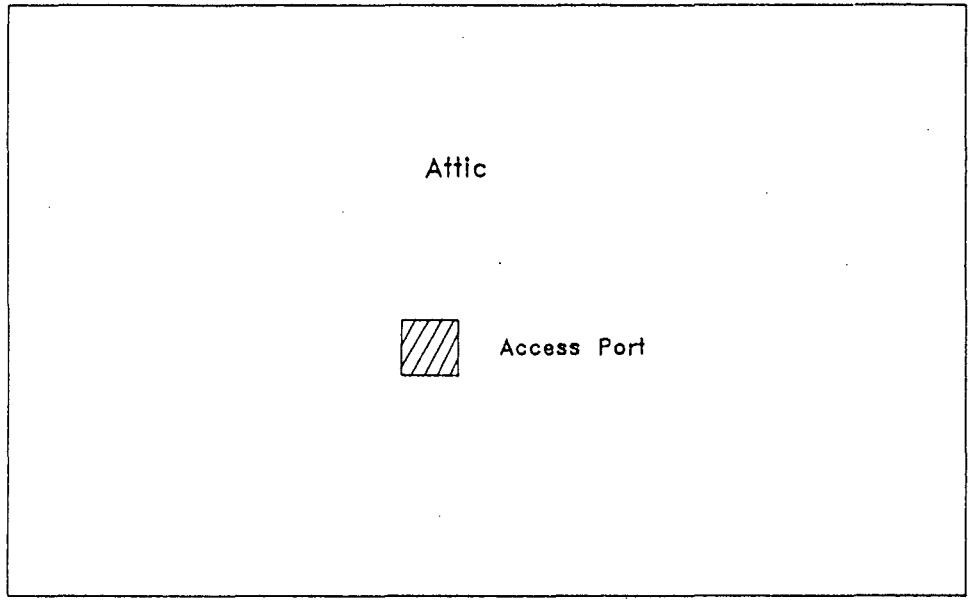
FLOOR PLAN & SAMPLE LOCATIONS
BLDG 993, FIRST FLOOR
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.3-1



EXPLANATION

o ASBESTOS SAMPLE LOCATION

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FEET

R.L. STOLLAR & ASSOCIATES INC.
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FLOOR PLAN & SAMPLE LOCATIONS
BLDG 993, ATTIC
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991

Figure 3.3-2

Table 3.4-1 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Building 994, Friable Materials

Sample CGA No.	Assess Form No.	Floor No.	Room No.	Function	Room No.s	DAMAGE OR RISK: Phys Dmg	Wtr Dmg	Prox/ Repair	Mat'l Type	Cont Pot.	Asb Cont	Dmg Total
49	16	1	1	Ceiling panel	1	1	3	3	4	2	1	14
50	25	1	1	Ceiling panel	1	1	3	3	4	2	None	13
48	17	1	1A	Duct wrap	1A	1	0	0	3	2	None	6
47	15	1	1A	Roof insulation	1A	2	0	0	0	2	None	4
52B	14	1	5	Joint compound	1,3,4,4A,5,6,7	1	0	0	0	2	1	4
74D	14	1	5	Joint compound	1,3,4,4A,5,6,7	1	0	0	0	2	1	4
95	14	1	1	Wall/sheetrock	1,3,4,4A,5,6,7	1	0	0	4	2	None	7
96	14	1	5	Wall/sheetrock	1,3,4,4A,5,6,7	1	0	0	4	2	None	7
52A	14	1	5	Wall/sheetrock	1,3,4,4A,5,6,7	1	0	0	4	2	None	7

Sample CGA No.	Assess Form No.	Floor No.	Room No.	Function	Room No.s	EXPOSURE: Friab	Area Vis	Walls	Ven	Air Mvt	Act	Floor	Barr	Pop	Exp Total
49	16	1	1	Ceiling panel	1	3	1	1	0	2	0	1	4	2	14
50	25	1	1	Ceiling panel	1	3	1	1	0	2	0	1	4	2	14
48	17	1	1A	Duct wrap	1A	3	2	1	0	2	0	1	1	2	12
47	15	1	1A	Roof insulation	1A	1	1	1	0	2	0	1	1	2	9
52B	14	1	5	Joint compound	1,3,4,4A,5,6,7	1	0	1	0	2	0	1	2	2	9
74D	14	1	5	Joint compound	1,3,4,4A,5,6,7	1	0	1	0	2	0	1	2	2	9
95	14	1	1	Wall/sheetrock	1,3,4,4A,5,6,7	1	2	1	0	2	0	1	2	2	11
96	14	1	5	Wall/sheetrock	1,3,4,4A,5,6,7	1	2	1	0	2	0	1	2	2	11
52A	14	1	5	Wall/sheetrock	1,3,4,4A,5,6,7	1	2	1	0	2	0	1	2	2	11

Detailed explanations of "Damage or Risk" and "Exposure" categories and associated numerical ratings included in table 2.2-1.

Explanation:

PHYS DMG = Physical Damage
WTR DMG = Water Damage
PROX/REPAIR = Proximity to Items for Repair
MAT'L TYPE = Type of Material
CONT POT = Potential for Contact by Occupants
ASB CONT = Asbestos Content
DMG TOTAL = Damage Total
FLOOR = Floor
POP = Population

FRIAB = Friability
AREA VIS = Area of Visible Surface or Damaged Friable Material
WALLS = Surface Material
VEN = Ventilation
AIR MVT = Air Movement
ACT = Activity
BARR = Barriers
EXP TOTAL = Exposure Total

PSF1-ASB.TB2

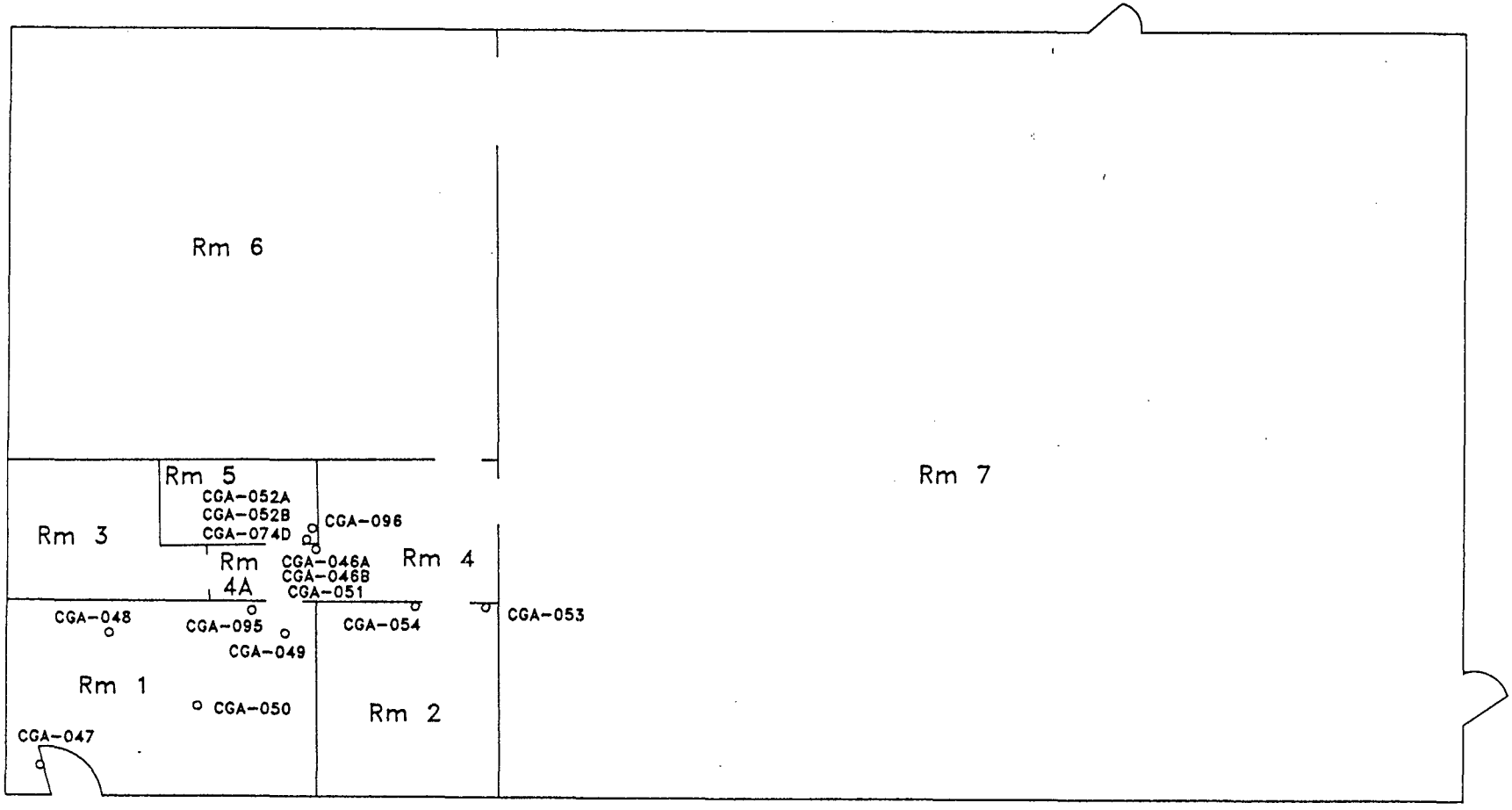
Table 3.4-2 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Building 994, Nonfriable Materials

Sample CGA No.	Bldg No.	Floor No.	Room No.	Function	Room No.s Where Present	Friability	Asbestos Content
46A	994	1	4A	Floor tile	1,3,4A	Nonfriable material	1
46B	994	1	4A	Floor tile mastik	1,3,4A	Nonfriable material	1
51	994	1	4A	Flex baseboard	1,3,4,4A,2,6	Nonfriable material	None
53	994	1	2	Wall/pegboard	2	Nonfriable material	None
54	994	1	2	Wall/masonite	2	Nonfriable material	None

Explanation:

Asbestos Content

1- 1-30%
3- 31-50%
5- >50%
No hazard- None



EXPLANATION

o ASBESTOS SAMPLE LOCATION

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FLOOR PLAN & SAMPLE LOCATIONS
BLDG 994, FIRST FLOOR
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991

Figure 3.4-1

Asbestos Lab Manager, Versar). Analysis of two additional samples of the Sheetrock (CGA-095 and CGA-096) yielded no detections of asbestos.

Sample CGA-049 was taken from one of two types of ceiling panels in Room 1. Laboratory analysis of this sample indicates 1-5 percent chrysotile asbestos content. Ceiling tiles are found only in Room 1.

Both nonfriable samples testing positive for asbestos are associated with 9-in. floor tile found in Rooms 1, 3, and 4A. The samples were taken from tile in Room 4A. Sample CGA-046A is from the tile itself, while sample CGA-046B is from the tile mastic. Laboratory analysis indicates 5-10 percent chrysotile asbestos in each of the samples.

3.5 BUILDING 995

Building 995 is the former boat house, a one-story, wood-frame structure with an attic and wood shake siding and roof. A total of 10 functional areas were inspected. A total of 10 samples were collected, seven friable (table 3.5-1) and three nonfriable (table 3.5-2), and sent to Versar for analysis. Figures 3.5-1 and 3.5-2 illustrate room and sample locations on each level of the structure. None of the friable samples tested positive while one of the nonfriable samples tested positive for asbestos. The sample testing positive was CGA-007B, from a linoleum work surface in Room 9 on the attic level, and contained 1-5 percent chrysotile asbestos. The work surface is covered by two layers of linoleum. The top layer, sample CGA-007A, does not contain asbestos while the sample containing asbestos (CGA-007B) came from the bottom layer.

3.6 BUILDING 996

Building 996 is referred to as the former electric shop and is a one-story structure with metal siding and roof. This is a one-room structure with only one functional area. A total of three samples were collected, two friable (table 3.6-1) and one nonfriable (table 3.6-2), and sent to Versar for analysis. Figure 3.6-1 illustrates the room and sample locations. None of the samples, friable or nonfriable, tested positive for asbestos.

3.7 BUILDING 997

Building 997 is the emergency generator building, a one-story structure with wood shake siding and roof. This is a one-room structure with only one functional area. Two samples were collected, one friable (table 3.7-1) and one nonfriable (table 3.7-2), and sent to Versar for analysis. Figure 3.7-1 illustrates the room and sample locations for this structure. Neither sample tested positive for asbestos.

Table 3.5-1 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 995, Friable Materials

Sample CGA No.	Assess Form No.	Floor No.	Room No.	Function	Room No.s	DAMAGE OR RISK: Phys Dmg	Wtr Dmg	Prox/ Repair	Mat'l Type	Cont Pot.	Asb Cont	Dmg Total
5	3	1	2	Wall/fiberboard	2	4	0	0	4	5	None	13
4	3	1	2	Wall/fiberboard	2	4	0	0	4	5	None	13
3	2	1	4	Wall/pegboard	4	2	0	0	2	2	None	6
1	1	1	1	Wall/sheetrock	1	4	0	0	4	2	None	10
2	1	1	1	Wall/sheetrock	1	4	0	0	4	2	None	10
9	6	1	3	Wall/sheetrock	3	2	0	0	4	2	None	8
8	6	1	3	Wall/sheetrock	3	2	0	0	4	2	None	8

Sample CGA No.	Assess Form No.	Floor No.	Room No.	Function	Room No.s	EXPOSURE: Friab	Area Vis	Walls	Ven	Air Mvt	Act	Floor	Barr	Pop	Exp Total
5	3	1	2	Wall/fiberboard	2	1	1	2	0	0	0	1	4	1	10
4	3	1	2	Wall/fiberboard	2	1	1	2	0	0	0	1	4	1	10
3	2	1	4	Wall/pegboard	4	1	0	2	0	2	0	1	4	1	11
1	1	1	1	Wall/sheetrock	1	1	1	1	0	2	0	1	2	1	9
2	1	1	1	Wall/sheetrock	1	1	1	1	0	2	0	1	2	1	9
9	6	1	3	Wall/sheetrock	3	1	2	2	0	2	0	1	2	1	11
8	6	1	3	Wall/sheetrock	3	1	2	2	0	2	0	1	2	1	11

Detailed explanations of "Damage or Risk" and "Exposure" categories and associated numerical ratings included in table 2.2-1.

Explanation:

PHYS DMG = Physical Damage
WTR DMG = Water Damage
PROX/REPAIR = Proximity to Items for Repair
MAT'L TYPE = Type of Material
CONT POT = Potential for Contact by Occupants
ASB CONT = Asbestos Content
DMG TOTAL = Damage Total
FLOOR = Floor
POP = Population

FRIAB = Friability
AREA VIS = Area of Visible Surface or Damaged Friable Material
WALLS = Surface Material
VEN = Ventilation
AIR MVT = Air Movement
ACT = Activity
BARR = Barriers
EXP TOTAL = Exposure Total

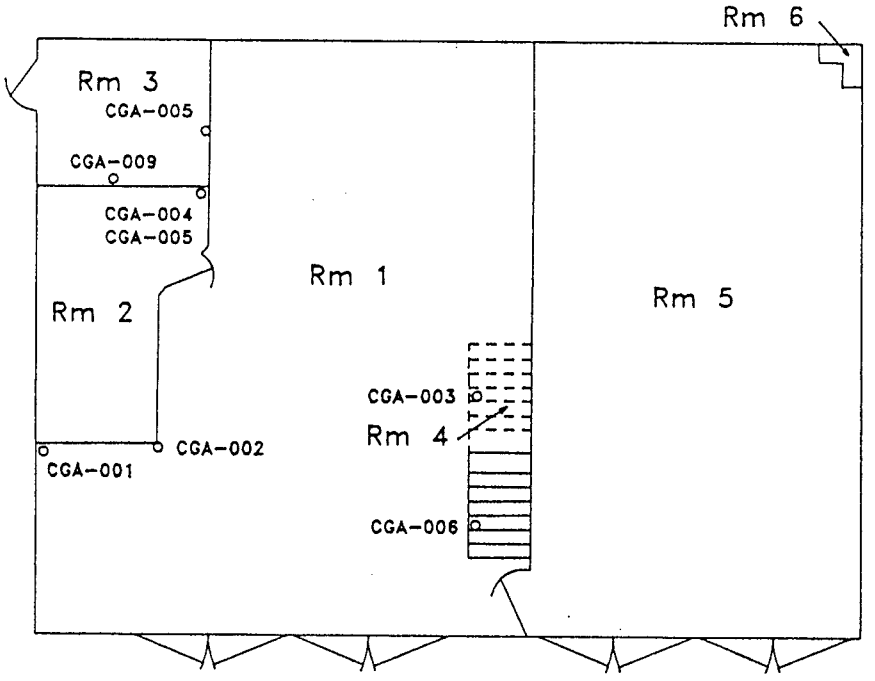
Table 3.5-2 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 995, Nonfriable Materials

Sample CGA No.	Bldg No.	Floor No.	Room No.	Function	Room No.s Where Present	Friability	Asbestos Content
7A	995	2	9	Tan countertop	9	Nonfriable material	None
7B	995	2	9	Blue contertop	9	Nonfriable material	1
6	995	Stairs		Skid plate	Stairs	Nonfriable material	None

Explanation:

Asbestos Content

1- 1-30%
3- 31-50%
5- >50%
No hazard- None



EXPLANATION

o ASBESTOS SAMPLE LOCATION

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FEET

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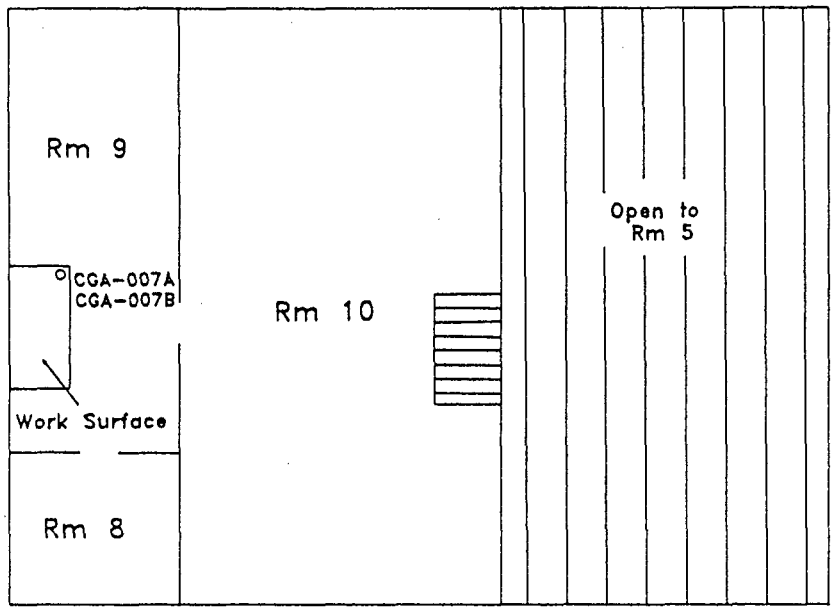
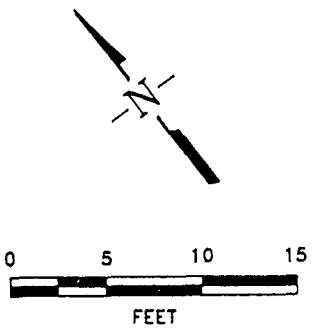
FLOOR PLAN & SAMPLE LOCATIONS
BLDG 995, FIRST FLOOR
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.5-1



EXPLANATION

o ASBESTOS SAMPLE LOCATION



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FLOOR PLAN & SAMPLE LOCATIONS
BLDG 995, ATTIC
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.5-2

Table 3.6-1 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 996, Friable Materials

							DAMAGE OR RISK						
Sample CGA No.	Assess Form No.	Bldg No.	Floor No.	Room No.	Function	Room No.s	Phys Dmg	Wtr Dmg	Prox/ Repair	Mat'l Type	Cont Pot.	Asb Cont	Dmg Total
72	27	996	1	1	Batt insulation	One room	5	0	0	3	0	None	8
73	27	996	1	1	Batt insulation	One room	5	0	0	3	0	None	8

							EXPOSURE									
Sample CGA No.	Assess Form No.	Bldg No.	Floor No.	Room No.	Function	Room No.s	Friab	Area Vis	Walls	Ven	Air Mvt	Act	Floor	Barr	Pop	Exp Total
72	27	996	1	1	Batt insulation	One room	6	0	2	0	0	0	1	1	1	11
73	27	996	1	1	Batt insulation	One room	6	0	2	0	0	0	1	1	1	11

Detailed explanations of "Damage or Risk" and "Exposure" categories and associated numerical ratings included in table 2.2-1.

Explanation:

PHYS DMG = Physical Damage
WTR DMG = Water Damage
PROX/REPAIR = Proximity to Items for Repair
MAT'L TYPE = Type of Material
CONT POT = Potential for Contact by Occupants
ASB CONT = Asbestos Content
DMG TOTAL = Damage Total
FLOOR = Floor
POP = Population

FRIAB = Friability
AREA VIS = Area of Visible Surface or Damaged Friable Material
WALLS = Surface Material
VEN = Ventilation
AIR MVT = Air Movement
ACT = Activity
BARR = Barriers
EXP TOTAL = Exposure Total

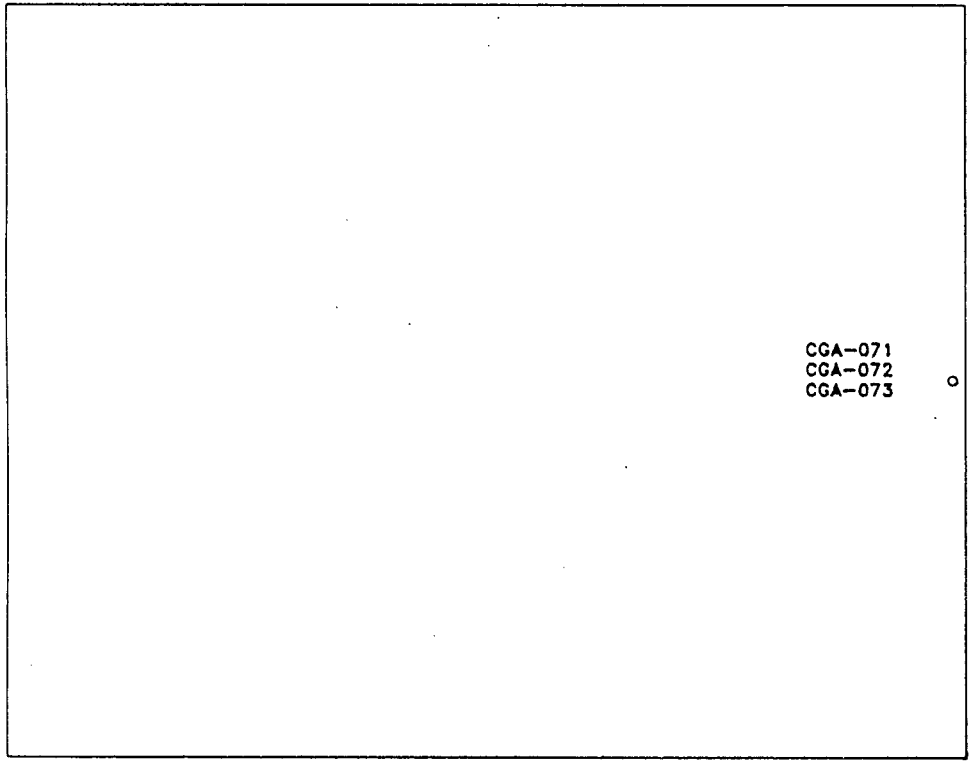
Table 3.6-2 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 996, Nonfriable Materials

Sample CGA No.	Bldg No.	Floor No.	Room No.	Function	Room No.s Where Present	Friability	Asbestos Content
71	996	1	1	Wall/fiberboard	1	Nonfriable material	None

Explanation:

Asbestos Content

1- 1-30%
3- 31-50%
5- >50%
No hazard- None



EXPLANATION

o ASBESTOS SAMPLE LOCATION

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FLOOR PLAN & SAMPLE LOCATIONS
BLDG 996
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.6-1

Table 3.7-1 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 997, Friable Materials

							DAMAGE OR RISK						
Sample CGA No.	Assess Form No.	Bldg No.	Floor No.	Room No.	Function	Room No.s	Phys Dmg	Wtr Dmg	Prox/ Repair	Mat'l Type	Cont Pot.	Asb Cont	Dmg Total
55	26	997	1	1	Exhaust stack wrap	One room	2	0	3	2	2	None	9

							EXPOSURE									
Sample CGA No.	Assess Form No.	Bldg No.	Floor No.	Room No.	Function	Room No.s	Friab	Area Vis	Walls	Ven	Air Mvt	Act	Floor	Barr	Pop	Exp Total
55	26	997	1	1	Exhaust stack wrap	One room	3	0	1	0	2	5	1	4	1	17

Detailed explanations of "Damage or Risk" and "Exposure" categories and associated numerical ratings included in table 2.2-1.

Explanation:

PHYS DMG = Physical Damage
WTR DMG = Water Damage
PROX/REPAIR = Proximity to Items for Repair
MAT'L TYPE = Type of Material
CONT POT = Potential for Contact by Occupants
ASB CONT = Asbestos Content
DMG TOTAL = Damage Total
FLOOR = Floor
POP = Population

FRIAB = Friability
AREA VIS = Area of Visible Surface or Damaged Friable Material
WALLS = Surface Material
VEN = Ventilation
AIR MVT = Air Movement
ACT = Activity
BARR = Barriers
EXP TOTAL = Exposure Total

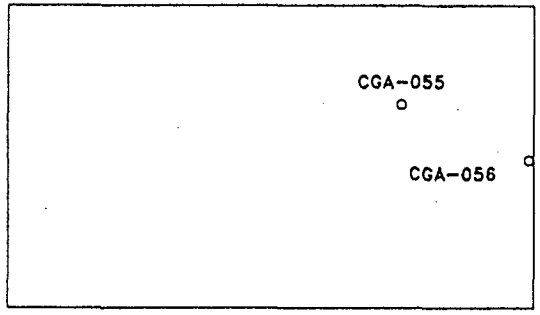
Table 3.7-2 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 997, Nonfriable Materials

Sample CGA No.	Bldg No.	Floor No.	Room No.	Function	Room No.s Where Present	Friability	Asbestos Content
56	997	1	1	Vinyl floor mat	1	Nonfriable material	None

Explanation:

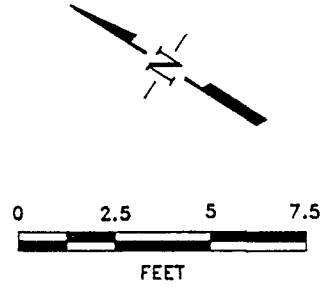
Asbestos Content

1- 1-30%
3- 31-50%
5- >50%
No hazard- None



EXPLANATION

o ASBESTOS SAMPLE LOCATION



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FLOOR PLAN & SAMPLE LOCATIONS
BLDG 997
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.7-1

3.8 BUILDING 998

Building 998 is a former maintenance shop, currently vacant, located at the end of the pier (figure 1.2-1). This building is a wood-frame, one-story structure with wood siding and asphalt shingles. A total of three functional areas including two rooms and an attic were inspected. A total of seven samples were collected, one friable (table 3.8-1) and six nonfriable (table 3.8-2), and sent to Versar for analysis. Figure 3.8-1 illustrates room and sample locations on each level of the structure. No asbestos was detected in the friable sample while one of the nonfriable samples tested positive. Sample CGA-075 from the counter top tile in Room 1 contained 1-5 percent chrysotile asbestos. This tile is found in no other location in the building.

3.9 BUILDING 999

Building 999 is the tide-gaging shack, a one-level, wood-frame structure with wood siding and asphalt shingles and asphalt sheet roofing. Although two rooms with separate entrances are present in this structure, only one room was entered. Keys for a small 3 ft x 3 ft shed adjoining the structure were not available. Visual inspection through a gap in the door confirmed that no suspect ACM is present in this shed. A total of six samples were collected, one friable (table 3.9-1) and five nonfriable (table 3.9-2), and sent to Versar for analysis. Figure 3.9-1 illustrates room and sample locations for the structure. No asbestos was detected in any of the samples.

3.10 QUALITY CONTROL SAMPLES

The analytical results for Quality Control (QC) (duplicate) samples were in agreement with their corresponding bulk samples. Of the seven QC samples obtained, six were determined by the lab to have no asbestos, which agreed with the analysis of corresponding bulk samples. Fairly good agreement was observed for the remaining QC sample, (GA-074) and its corresponding bulk sample (CGA-052B). Sample CGA-052 was split at the lab into two parts; CGA-052A which was identified as Sheetrock and CGA-052B, identified as joint compound. A trace of asbestos (<1 percent) was observed in CGA-052B. Sample CGA-074, the QC sample, was determined to contain 1-5 percent asbestos. Bench sheets at the lab indicate that the asbestos-containing material in sample CGA-074 was joint compound (pers. comm., Marcie Wilson, Asbestos Lab Manager, Versar).

Table 3.8-1 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 998, Friable Materials

							DAMAGE OR RISK						
Sample CGA No.	Assess Form No.	Bldg No.	Floor No.	Room No.	Function	Room No.s	Phys Dmg	Wtr Dmg	Prox/ Repair	Mat'l Type	Cont Pot.	Asb Cont	Dmg Total
77	30	998	1	1	Batt insulation	1	2	0	0	4	0	None	6

							EXPOSURE									
Sample CGA No.	Assess Form No.	Bldg No.	Floor No.	Room No.	Function	Room No.s	Friab	Area Vis	Walls	Ven	Air Mvt	Act	Floor	Barr	Pop	Exp Total
77	30	998	1	1	Batt insulation	1	6	2	2	0	0	0	2	1	1	14

Detailed explanations of "Damage or Risk" and "Exposure" categories and associated numerical ratings included in table 2.2-1.

Explanation:

PHYS DMG = Physical Damage
WTR DMG = Water Damage
PROX/REPAIR = Proximity to Items for Repair
MAT'L TYPE = Type of Material
CONT POT = Potential for Contact by Occupants
ASB CONT = Asbestos Content
DMG TOTAL = Damage Total
FLOOR = Floor
POP = Population

FRIAB = Friability
AREA VIS = Area of Visible Surface or Damaged Friable Material
WALLS = Surface Material
VEN = Ventilation
AIR MVT = Air Movement
ACT = Activity
BARR = Barriers
EXP TOTAL = Exposure Total

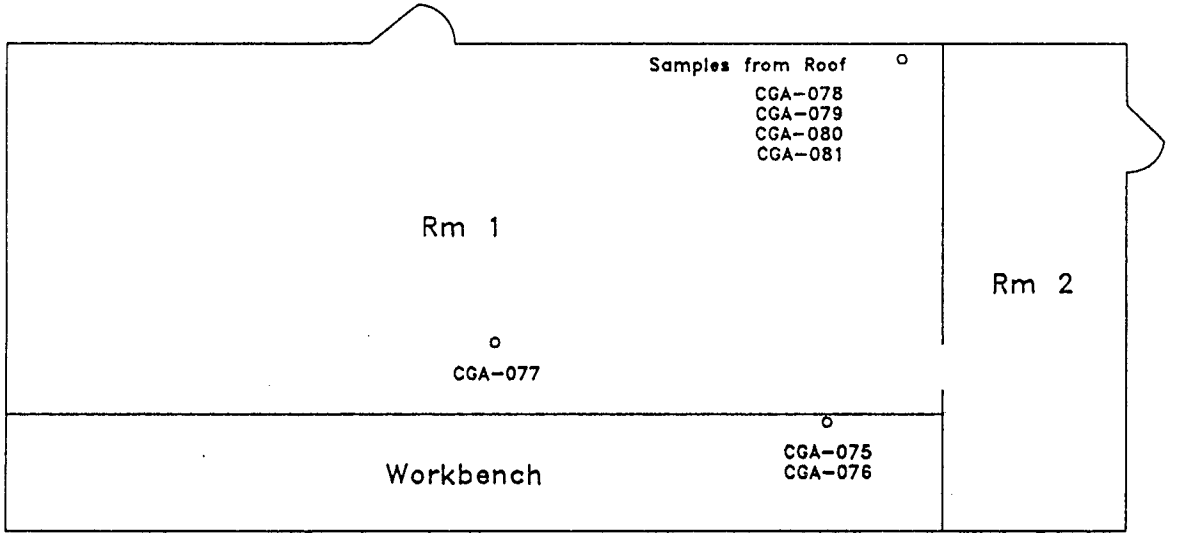
Table 3.8-2 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 998, Nonfriable Materials

Sample CGA No.	Bldg No.	Floor No.	Room No.	Function	Room No.s Where Present	Friability	Asbestos Content
75	998	1	1	Countertop, tile	1	Nonfriable material	1
76	998	1	1	Countertop adhesive	1	Nonfriable material	None
78	998	Roof	Roof	Asphalt shingles	Roof	Nonfriable material	None
79	998	Roof	Roof	Asphalt shingles	Roof	Nonfriable material	None
80	998	Roof	Roof	Roofing felt	Roof	Nonfriable material	None
81	998	Roof	Roof	Asphalt shingles	Roof	Nonfriable material	None

Explanation:

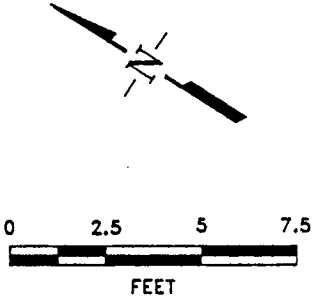
Asbestos Content

1- 1-30%
3- 31-50%
5- >50%
No hazard- None



EXPLANATION

o ASBESTOS SAMPLE LOCATION



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FLOOR PLAN & SAMPLE LOCATIONS
BLDG 998
FT. POINT U.S. COAST GURAD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.8-1

Table 3.9-1 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 999, Friable Materials

Sample CGA No.	Assess Form No.	Bldg No.	Floor No.	Room No.	Function	Room No.s	DAMAGE OR RISK: Phys Dmg	Wtr Dmg	Prox/ Repair	Mat'l Type	Cont Pot.	Asb Cont	Dmg Total
87	33	999	1	1	Sealant	1	0	0	2	2	0	None	4

Sample CGA No.	Assess Form No.	Bldg No.	Floor No.	Room No.	Function	Room No.s	EXPOSURE: Friab	Area Vis	Walls	Ven	Air Mvt	Act	Floor	Barr	Pop	Exp Total
87	33	999	1	1	Sealant	1	3	0	2	0	0	0	2	4	1	12

Detailed explanations of "Damage or Risk" and "Exposure" categories and associated numerical ratings included in table 2.2-1.

Explanation:

PHYS DMG = Physical Damage
WTR DMG = Water Damage
PROX/REPAIR = Proximity to Items for Repair
MAT'L TYPE = Type of Material
CONT POT = Potential for Contact by Occupants
ASB CONT = Asbestos Content
DMG TOTAL = Damage Total
FLOOR = Floor
POP = Population

FRIAB = Friability
AREA VIS = Area of Visible Surface or Damaged Friable Material
WALLS = Surface Material
VEN = Ventilation
AIR MVT = Air Movement
ACT = Activity
BARR = Barriers
EXP TOTAL = Exposure Total

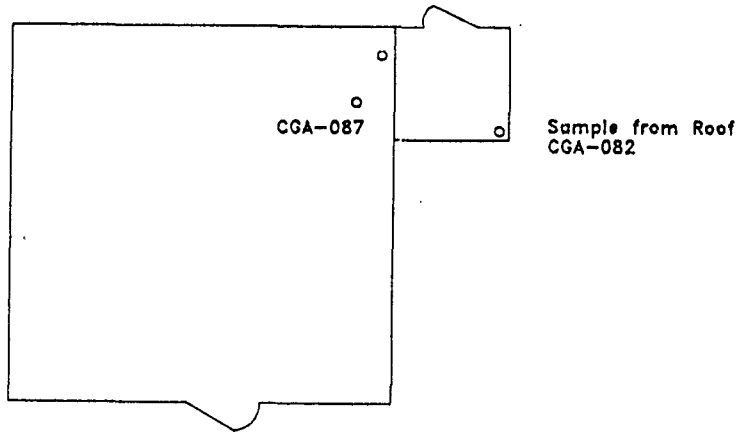
Table 3.9-2 Fort Point U.S. Coast Guard Station Facility Survey Data Sheet, Bldg 999, Nonfriable Materials

Sample CGA No.	Bldg No.	Floor No.	Room No.	Function	Room No.s Where Present	Friability	Asbestos Content
82	999	Roof	Roof	Asphalt sheet roofing	Roof	Nonfriable material	None
83	999	Roof	Roof	Asphalt shingles	Roof	Nonfriable material	None
84	999	Roof	Roof	Asphalt sheet roofing	Roof	Nonfriable material	None
85	999	Roof	Roof	Roofing felt	Roof	Nonfriable material	None
86	999	Roof	Roof	Roofing felt	Roof	Nonfriable material	None

Explanation:

Asbestos Content

1- 1-30%
3- 31-50%
5- >50%
No hazard- None



EXPLANATION

o ASBESTOS SAMPLE LOCATION

N

0 2.5 5 7.5

FEET

R.L. STOLLAR & ASSOCIATES INC.
Ground-Water Consultants

FLOOR PLAN & SAMPLE LOCATIONS
BLDG 999
FT. POINT U.S. COAST GUARD STATION
ASBESTOS SURVEY

Date: July 1991 | Figure 3.9-1

4.0 ASSESSMENT AND RECOMMENDED CORRECTIVE ACTIONS

In the building-by-building assessment discussion that follows, friable and nonfriable asbestos are identified at the facility, a determination of the assessment index is made using the Guide for Asbestos Hazard Assessment in U. S. Army Facilities (friable ACM only) (CERL, 1988), and recommendations regarding corrective actions are presented.

4.1 BUILDING 991

Linoleum flooring in the laundry room (Room 28), located on the second floor of the building, contains 20-25 percent chrysotile asbestos (Sample CGA-032). The asbestos containing component of this sample is the paper-like backing of the linoleum which, in itself, is friable. However, since it is covered by durable, non-ACM vinyl linoleum it does not pose an exposure risk unless the linoleum becomes damaged or is removed. The linoleum in this room is in good condition and requires no immediate action. Periodic inspections of this area should be conducted to verify the integrity of the linoleum surface and any damage that has occurred to expose the asbestos-containing backing should be promptly repaired. Inspections and repairs should be conducted by properly trained and accredited personnel.

4.2 BUILDING 992

Two types of friable ACM were identified in Building 992; joint compound in Room 16 (samples CGA-065 and CGA-091) containing 1-5 percent chrysotile asbestos, and paper duct wrap in the attic and crawl space (samples CGA-063, CGA-066, and CGA-067) containing 25-55 percent chrysotile asbestos. Nonfriable ACM was not identified during the survey or sampling.

4.2.1 ASBESTOS CONTAINING JOINT COMPOUND

Lath and plaster walls and ceilings were found in 15 rooms of Building 992. As a result of past renovation projects, some of the walls in Rooms 7, 8, 12, 16, 17, and 20 were replaced with Sheetrock and coated with a skim coat possibly composed of joint compound. Sample analyses indicates that no asbestos is contained in the wall plaster; however, joint compound sampled behind light switches in Room 16 contains 1-5 percent chrysotile asbestos (samples CGA-065 and CGA-091).

For purposes of determination of recommended corrective action, and in the absence of specific sample analysis of the skim coat material, it is assumed that the skim coat is comprised of the same asbestos-containing joint compound found behind the light switches. The pertinent areas were all found to be in good condition with only minor localized damage. The quantitative analysis of damage, risk, and exposure for the joint compound is summarized in table 4.2-1. An Assessment

Table 4.2-1 Friable ACM Assessment Worksheet for joint compound found in Building 992

Facility:	Fort Point U.S. Coast Guard Station
Building #:	992
Inspector(s):	Bill Alexander Joan Henehan

Material Type/Function:	Joint Compound
Assessment Form #:	20*
Rooms Where Present**:	3, 4, 6, 7, 8, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22

DAMAGE/RISK

Physical Damage:	1
Water Damage:	0
Poximity/Repair:	0
Material Type:	1
Contact Potential:	2
Asbestos Content:	1
Damage Total:	5

EXPOSURE

Friability:	1
Area Visible:	0
Walls:	1
Ventilation:	0
Air Movement:	2
Acitvity:	0
Floor:	4
Barriers:	2
Population:	1
Exposure Total:	11
Assessment Index:	C

Sample #'s:	CGA-065 1-5% CGA-091 1-5%

* Modified from Assessment Form #20, form was filled out for wall and ceiling plaster, however asbestos was detected only in joint compound.

** Refer to floor plans showing sample locations for room designations.

Index of C is assigned. This index requires "planned action". This action should include: assessment by accredited personnel (table 2.2-3) who are experienced in and qualified to conduct asbestos assessments, and initiation of a special O & M program. Prior to embarking on a program to remove the skim coat, the building should be inspected to determine which walls were replaced with Sheetrock, and to determine whether the skim coat contains asbestos. If the skim coat is determined to be ACM, removal should be scheduled as part of the normal repair and maintenance cycle of the facility, minimizing cost and disturbance. With respect to repairs made to these areas, particular attention should be paid to avoid dry sanding or cutting suspect ACM. Appropriate precautions including HEPA vacuuming, wet wiping ACM debris, and wearing proper personal protective equipment should be adhered to while working with this material.

4.2.2 Asbestos Containing Duct Wrap

The duct wrap found in the attic and crawl space is moderately friable, contains up to 55 percent chrysotile asbestos, and is significantly damaged in a number of places with evidence that the dirt floor of the crawl space also contains asbestos debris. In the process of collecting samples from the crawl space, it was found that the supply air ductwork had become disconnected immediately beneath Room 5A, which serves as a plenum for this supply air. Therefore, it has been recommended that air sampling be performed in the rooms that are serviced by the damaged duct to determine whether or not asbestos is being released into the building.

The quantitative analysis of damage, risk, and exposure are summarized in table 4.2-2. An Assessment Index of B is assigned. This index requires "action as soon as possible." This action should include: assessment by accredited personnel (table 2.2-3) who are experienced in and qualified to conduct asbestos assessments, immediate initiation of a special O & M program, limiting access to the area, and scheduling of removal during periods of low activity in the facility without waiting for the normal repair and maintenance cycle. Personnel entering the area prior to the completion of corrective action should wear disposable protective clothing and cartridge respirators with HEPA filters. Warning signs should be posted at the crawl space and attic entrances. An option to removal of the ductwork is to repair and coat or wrap the duct with a nonasbestos encapsulating material. Replacement would be the more prudent choice since it is possible that the interior surfaces of the duct may also be contaminated. Encapsulation of the ACM would require a continued O & M program. Either remedial measure should be accompanied by vacuuming the ACM debris from the dirt floor of the crawl space and attic floor.

Table 4.2-2 Friable ACM Assessment Worksheet for duct wrap found in Building 992

Facility:	Fort Point U.S. Coast Guard Station
Building #:	992
Inspector(s):	Bill Alexander Joan Henehan
Material Type/Function:	Paper Duct Wrap
Assessment Form #:	22
Rooms Where Present*:	Crawlspace, 13A, Attic

DAMAGE/RISK

Physical Damage:	4
Water Damage:	0
Poximity/Repair:	3
Material Type:	3
Contact Potential:	0
Asbestos Content:	5
Damage Total:	15

EXPOSURE

Friability:	3
Area Visible:	2
Walls:	2
Ventilation:	5
Air Movement:	2
Acitvity:	2
Floor:	3
Barriers:	1
Population:	1
Exposure Total:	21
Assessment Index:	B
Sample #'s:	CGA-063, CGA-066, CGA-067**

* Refer to floor plans showing sample locations for room designations.

** Sample CGA-063 contained 50-55% asbestos while samples CGA-066 and CGA-067 contained 25-30% asbestos. Since material appears the same, the higher % is assumed for remediation recommendations.

4.3 BUILDING 994

Four types of ACM were found in Building 994, two friable and two nonfriable. The friable materials were joint compound and 2 ft x 4 ft suspended ceiling tiles. The nonfriable materials were vinyl asbestos tile and tile mastic.

4.3.1 JOINT COMPOUND

Lab analysis of samples of joint compound collected from Room 5 indicates that this material contains 1-5 percent chrysotile asbestos. The pertinent areas were all found to be in good condition with only minor localized damage. The quantitative analysis of damage, risk, and exposure for the joint compound is summarized in table 4.3-1. An Assessment Index of C is assigned. This index requires "planned action." This action should include: assessment by accredited personnel (as defined in table 2.2-3) who are experienced in and qualified to conduct asbestos assessments, and initiation of a Special O & M program. Removal should be scheduled as part of the normal repair and maintenance cycle of the facility, minimizing cost and disturbance. With respect to repairs made to these areas, particular attention should be paid to avoid dry sanding or cutting suspect ACM. Appropriate precautions including HEPA vacuuming, wet wiping of any ACM debris, and wearing proper personal protective equipment should be adhered to while working with this material. Future renovation or demolition projects conducted in these areas should be preceded by additional bulk sampling to confirm the presence or absence of ACM.

4.3.2 CEILING PANELS

Ninety-five percent of the ceiling panels found in Room 1 contain 1-5 percent chrysotile asbestos and approximately 30 percent of these panels are water damaged. The quantitative analysis of damage, risk, and exposure for the ceiling panels is summarized in table 4.3-2. An Assessment Index of C is assigned. This index requires "planned action." This action should include: assessment by accredited personnel (table 2.2-3) who are experienced in and qualified to conduct asbestos assessments and initiation of a Special O & M program. Removal of the panels should be scheduled as part of the normal repair and maintenance cycle of the facility, minimizing cost and disturbance. In the event that a damaged panel becomes dislodged from the ceiling, qualified personnel should initiate clean-up actions. Access above the dropped ceiling shall only be permitted to persons trained in handling friable asbestos materials and who are wearing proper personal protective equipment.

Table 4.3-1 Friable ACM Assessment Worksheet for joint compound found in Building 994

Facility:	Fort Point U.S. Coast Guard Station
Building #:	994
Inspector(s):	Bill Alexander Joan Henehan
Material Type/Function:	Sheetrock Joint Compound
Assessment Form #:	14*
Rooms Where Present**:	1, 2, 3, 4, 4A, 5, 6, 7

DAMAGE/RISK

Physical Damage:	2
Water Damage:	0
Poximity/Repair:	0
Material Type:	0
Contact Potential:	2
Asbestos Content:	1
Damage Total:	5

EXPOSURE

Friability:	1
Area Visible:	0
Walls:	1
Ventilation:	0
Air Movement:	2
Acitvity:	0
Floor:	1
Barriers:	2 Painted
Population:	2
Exposure Total:	9
Assessment Index:	C
Sample #'s:	CGA-062, CGA-074D

* Modified from Assessment Form #14, form was filled out for sheetrock walls, however asbestos was detected only in the joint compound.

** Refer to floor plans showing sample locations for room designations.

Table 4.3-2 Friable ACM Assessment Worksheet for ceiling panels found in Building 994

Facility:	Fort Point U.S. Coast Guard Station
Building #:	994
Inspector(s):	Bill Alexander Joan Henehan
Material Type/Function:	Ceiling Panels
Assessment Form #:	16
Rooms Where Present*:	1

DAMAGE/RISK

Physical Damage:	1
Water Damage:	0
Poximity/Repair:	3
Material Type:	4
Contact Potential:	2
Asbestos Content:	1
Damage Total:	11

EXPOSURE

Friability:	3
Area Visible:	2
Walls:	1
Ventilation:	0
Air Movement:	2
Acitvity:	0
Floor:	1
Barriers:	4
Population:	2
Exposure Total:	15
Assessment Index:	C
Sample #'s:	CGA-049

* Refer to floor plans showing sample locations for room designations.

4.3.3 VINYL ASBESTOS TILE AND MASTIC

Vinyl asbestos tile was found in Rooms 1,3, and 4a (figure 3.4-1). Both the tile and mastic were found to contain 5-10 percent chrysotile. It is possible that vinyl tile also exists underneath the carpeting in the adjacent rooms. The flooring in the building is believed to be concrete.

Since the identified tile is nonfriable and in good condition there is no need for further corrective action beyond periodic inspections by an accredited inspector. Routine maintenance activities should discourage mechanical wax stripping and instead use chemical wax stripping products that will not remove asbestos from the tiles. Renovation or demolition projects that would require the removal of the tile and mastic should only be performed using standard asbestos abatement practices.

4.4 BUILDING 995

Building 995 contains asbestos in the form of linoleum on a work surface in Room 9. The asbestos-containing linoleum is covered by a layer of nonasbestos linoleum and does not pose an exposure risk unless the lower layer of linoleum is damaged or removed. No further action is required other than documenting its presence and assuring that work disturbing this material is done in accordance with proper asbestos control procedures.

4.5 BUILDING 998

The only asbestos found in Building 998 is the vinyl asbestos tile covering the top of the workbench. It was found to contain 1-5 percent chrysotile asbestos. No asbestos was found in the tile mastic. The condition of the ACM is fair with the potential to release fibers if work activities such as hammering, sawing, drilling, etc., occur on the tile.

Since the building is currently vacant and is to remain vacant, no further action is necessary. If the building is reoccupied, periodic O & M surveys should be conducted by accredited personnel. Resumption of work activities at the bench that would cause the tile to release fibers should be preceded by removal of the tile or covering the top of the workbench with a durable, new surfacing material such as Masonite. If the tile is covered in this manner, periodic O & M inspections will need to be conducted by an accredited inspector. If the decision is made to remove the tile, removal should be done only by personnel qualified in asbestos abatement procedures.

5.0 REFERENCES

U.S. Army Technical Manual (TM) No. 5-612, Asbestos Control, Draft, 25 January 1989.

Guide for Asbestos Hazard Assessment in U.S. Army Facilities, Draft 28 November 1988, CERL Environmental Engineering team, Bernie Donahue.

SURVEYING FOR ASBESTOS, DOCUMENTATION AND RECORDKEEPING

Surveys are necessary to locate, sample and analyze potential asbestos containing material. Surveys may be done in house or through the use of contractor personnel. All personnel conducting surveys must have formal EPA accredited inspector training.

Types of facility surveys

a. Facility wide survey - includes both friable and nonfriable asbestos. It is non-destructive in nature. Structural members such as wall, floors are not removed. However, moveable objects such as ceiling tiles, furniture are displaced for the purpose of collecting samples.

b. Pre-design or project survey - is very comprehensive and will be conducted prior to any alteration, repair or demolition work in a particular building. Samples of all suspect asbestos containing material (friable and non-friable) should be collected. A mix of destructive and non-destructive techniques are used in the sampling process.

Survey objectives:

a. Identify, catalog and document structures that are scheduled for alteration, repair and demolition within three years

b. Identify, catalog and document the remainder of structures and locations where asbestos containing materials are present via facility building lists and building inspection priority lists

c. Visually assess the present and future physical integrity of the asbestos containing material

d. Collect bulk samples to determine asbestos content of suspect asbestos containing material

e. To sample for airborne fiber levels, if necessary

f. To create a data base for determining appropriate abatement, maintenance and construction activities

Survey procedures:

a. Development of facility building list - Provides a basic inventory to aid in the prioritization of surveys. Master plans or building inventory records may be used to establish the list. All building records should be utilized to determine usage, description, and condition. The list should be updated on a regular basis (preferably annually).

b. Development of the inspection priority list - used to determine which buildings require the most prompt attention. Reviews of work orders, Health Hazard Inventories and maintenance records are useful tools to determine the presence and condition of asbestos containing materials. Generally, prioritization should be as follows:

1. Buildings where suspect friable asbestos containing materials have been identified and where the occupants may be exposed to an airborne health hazard.

2. Buildings that have been scheduled for alteration, repair or demolition within three years

3. All other structures - These buildings may be categorized according to the following descriptions:

a. "Highly Suspect" are known to have friable asbestos containing material with a high potential for release due to damage

b. "Suspect" are buildings believed to contain some asbestos containing material (friable or non friable, not in disrepair)

c. "Non-Suspect" are buildings not suspected of containing any Asbestos containing material(ACM)

c. Facility survey - involves visual inspection of the entire building to locate ACM, describe its application and assess its friability and condition. It will include bulk sampling. Personal protective equipment must be used by survey team members where there is a potential for airborne exposure to asbestos in excess of the action level as described in TB MED 513. HEPA filtered equipment and wet techniques will be used as appropriate. A written protocol will be established which defines the conduct of the inspection. Written protocols should include the building inspection priority list and summary of records review, procedures for examining the building, instructions for completing ACM survey data sheets and requirements for personal protective equipment and practices. General procedures for conducting surveys of the various types of ACM are outlined below:

1. Sprayed or troweled on surfacing materials -

a. Identify surfacing materials that may contain asbestos by locating any acoustical plaster or surfacing materials on walls, ceilings, beams, ducts and other surfaces.

b. Determine if the material is friable.

c. Group friable material into homogeneous areas. A homogeneous area contains material that seems by texture and color to be uniform.

d. Complete an ACM survey data sheet for each homogeneous area.

e. Specific information for sprayed or troweled on surfacing materials should be annotated as indicated on the sample survey form

2. Pipe, boiler and tank insulation -

a. Identify pipes, boilers, tanks, ducts and other surfaces that are insulated by following distribution systems throughout the building. All insulating materials found on distribution systems do not necessarily contain asbestos, however, pipe elbows and joints are likely to be covered with ACM.

b. Delineate homogeneous areas

c. Complete an ACM survey data sheet for each homogeneous area

d. Specific information for pipe, boiler and tank insulation should be annotated as indicated on the sample survey form

3. Other types of ACM-

a. Identify other types of ACM in this category which may include siding, ceiling tile, floor tile, acoustical tile, fire door interiors. Most ACM in this category is non friable and as such should not be considered a primary inspection priority unless the integrity of the material is compromised. Non friable ACM should also be sampled when necessary to document the presence and location of the materials in permanent records for use during building use changes or demolition. A primary concern with this type of ACM is environmental considerations where it has been handled and stored. It may also become an occupational health hazard for personnel who must handle and work with these products.

d. Visual assessment of ACM - should be done regardless of the type of ACM being inspected. Several factors relating to the integrity of the ACM must be noted which include friability, physical condition, water damage, vibration/impact damage, quantity, occupant/user accessibility, area/building use, ACM application and use, proximity to air plenum or direct air stream.

e. Collection of ACM samples - The most significant aspect of bulk sampling is the collection of a sufficient number of samples to adequetely characterize the extent of ACM in a particular location or building. Samples should be sent to a laboratory that is a successful passing participant in the latest two rounds (with a minimum score of 3 out of 4) in the interim EPA Bulk Sampling Quality Assurance Accreditation Program for analysis using polarized light microscopy. Bulk sampling may be done during or after the building survey, but it is recommended that it be accomplished during the survey so that additional time, effort and site visits are not required. Returning to the site would, however, allow the survey team to develop a sampling strategy that considers specific building conditions. Sampling of suspect surfacing ACM shall follow the guidance provided in the EPA publication ("Simplified sampling schemes for friable surfacing materials (EPA 560/5-85-030Q)).

Procedures -

a. Designation of homogeneous area - A homogeneous sampling area is defined as an area containing materials that are unifrom in texture and appearance, were installed at the same time and are unlikely to consist of more than one type or formulation.

b. Development of a standard operating procedure - An SOP should be developed for bulk sampling that defines sampling practices, equipment to be used, personal protective equipment and other pertinent items.

c. Specific protocols

1. Sprayed or troweled on surfacing materials - At least three bulk samples should be collected in each homogeneous area that is 1000 square feet or less. At least five bulk samples should be collected for each homogeneous area that is greater than 1000 square feet but less than or equal to 5000 square feet. At least seven bulk samples should be collected for each homogeneous area that is greater than 5000 square feet. Finish and scratch coats should be sampled seperately. Locations should be selected evenly distributed throughout the area or by a statistically random selection method.

2. Pipe, boiler and tank insulation - Bulk samples should be collected from each homogeneous area where the insulation is damaged or exposed. At least three bulk samples should be collected from each homogeneous area of pipe, boiler and tank insulation. At least one bulk sample should be collected for each homogeneous area of patched insulation. On insulated mechanical systems not assumed to be ACM, where cement or plaster is used, a sufficient characterization shall be developed to assure material is not ACM. This may necessitate bulk sampling from fittings such as tees, elbows or valves.

3. "Other ACM" - For any homogeneous area of "other ACM" bulk samples should be collected in such a manner sufficient to determine whether the material is ACM or not

d. Air Sampling - Although not normally part of the building survey procedure, the technique may be utilized in the assessment process under special circumstances.

e. Bulk sampling kit - the sampling kit should be assembled prior to the survey and should include the following:

- Plastic squeeze bottle containing water and a wetting agent. A 5% soap solution may also be used.
- Plastic containers with snap or screw tops or any durable container with a secure top. Tops usually need to be secured with tape.
- Tweezers, cork bores and knives as aids for taking samples if the container cannot easily penetrate the material
- Container labels for identifying samples
- Sample log forms
- Tapemeasure
- Paper towels for wiping sampling tools and containers
- Tape
- Indelible marker
- Disposable plastic gloves
- Disposable coveralls
- Protective eyewear
- Plastic bags for disposal of excess debris and used protective equipment

- Disposable drop cloth
- Respiratory protection, as necessary
- Ladder, when anticipating out of reach sampling locations
- Portable HEPA vacuum to clean areas disturbed by survey
- Flashlight
- Camera

f. Other considerations -

1. Sample identification - the sample identification number should be a unique number assigned to a bulk sample. It should never be issued to other samples from the same building or survey. The sample ID number should be recorded on the survey form corresponding to the location where the bulk sample is collected. The numbering scheme for identification of bulk samples should be developed before any surveys are undertaken and remain consistent during the entire survey. An example of a numbering scheme might be the use of ascending numerals paired with the building number. A permanent ID number logbook should be maintained as a back up system. ID numbers, sample locations, sampling date, surveyor, results and remarks should be recorded in the log book.

2. Quality control samples - QC samples are collected to confirm the results of the laboratory performing the bulk analysis. QC samples may be sent to another laboratory or to the laboratory already being utilized. In the latter case the laboratory should not be informed that the sample is a QC check. QC samples must be analyzed utilizing the same methodology. Samples should be collected from an area abutting the regular bulk sample.

3. Sample collection -

a. Wetting process - The bulk sampling process for friable materials requires spraying of the sampling area with amended or soapy water. The immediate sampling area should be thoroughly wet before samples are collected. Non friable or hard types of asbestos can be coated with a liquid dishwashing detergent, which will trap any loose particles.

b. Collection of sample - The bulk sample should be collected using the container to penetrate the material. When this cannot be accomplished, the sample may be removed by using tweezers, cork bore or knife. After filling the container, it should be wiped off to prevent possible cross contamination or exposure.

c. Containment - After collection of the sample, the area should be sealed to prevent further release of asbestos fibers. The seal may be used to indicate ACM; This may be accomplished with spray paint and duct tape. However, spray painting a deteriorated area might disperse asbestos fibers. In those cases it is recommended that the area be wrapped in duct tape. Large areas may be wrapped in plastic sheeting and then covered with duct tape.

d. Sample label - Sample labels should only contain necessary information so not to introduce analytical bias. ID number, date sampled and surveyor should be sufficient.

e. Sample log form - The sample log form contains more descriptive information and should be completed at the time of sample collection. The sample log form is a permanent record of all samples taken for analysis. This is supplemented by the sample log.

f. Building sample area drawing - These are standard dimension, single line drawings that show the plan view of the location of bulk sample points

g. Handling of sample container - It is recommended that all sample containers be sealed with tape around the cap to avoid contamination or loss of sample material.

h. Decontamination of sampling accessories - all sampling devices should be wiped immediately after each use with a damp paper towel. If disposable devices are used it should be discarded in a plastic bag, which is also used for disposal of coveralls, gloves and other disposables. Where dropcloths are used, the cloth should be misted with water and than folded in upon itself and disposed of as contaminated material. Where debris has fallen off, large pieces shall be picked up and disposed in a double plastic bag. Any residual material should be HEPA vacuumed or thoroughly wet moped.

i. Special precautions - Proper sampling techniques and sequencing must be used to avoid incorrect results and cross contamination. All material under investigation should be considered a potential source of airborne asbestos. Disturbance of potential ACM should be kept to a minimum. Personnel collecting samples and observers in the vicinity must use personal protective equipment as necessary.

4. Recordkeeping - All forms, reports and contract specifications and agreements applicable to the building survey must be placed in the appropriate building folder. Each building should have its own individual folder to avoid confusion. Ideally, a comprehensive database file should be established for organizing ACM survey information.

The following documents/information should be stored in the building folder and/or data base file:

1. ACM survey data sheets
2. Building sample area drawings
3. Sample log form
4. Laboratory report of bulk samples
5. Copies of work orders, contract submittals, contract change orders and addenda.

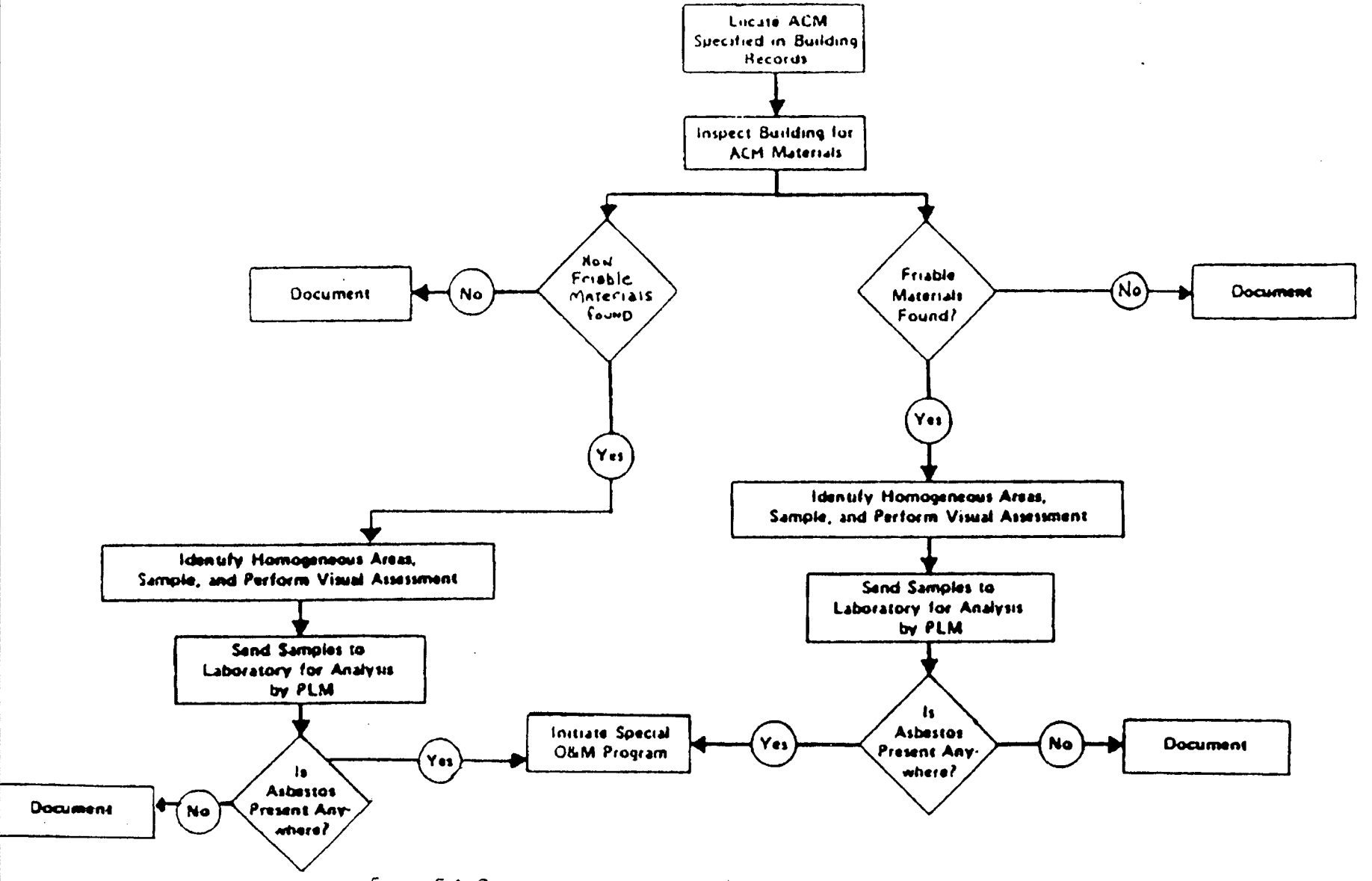


Figure 5-1. General survey procedures for sprayed- or troweled-on surfacing material.

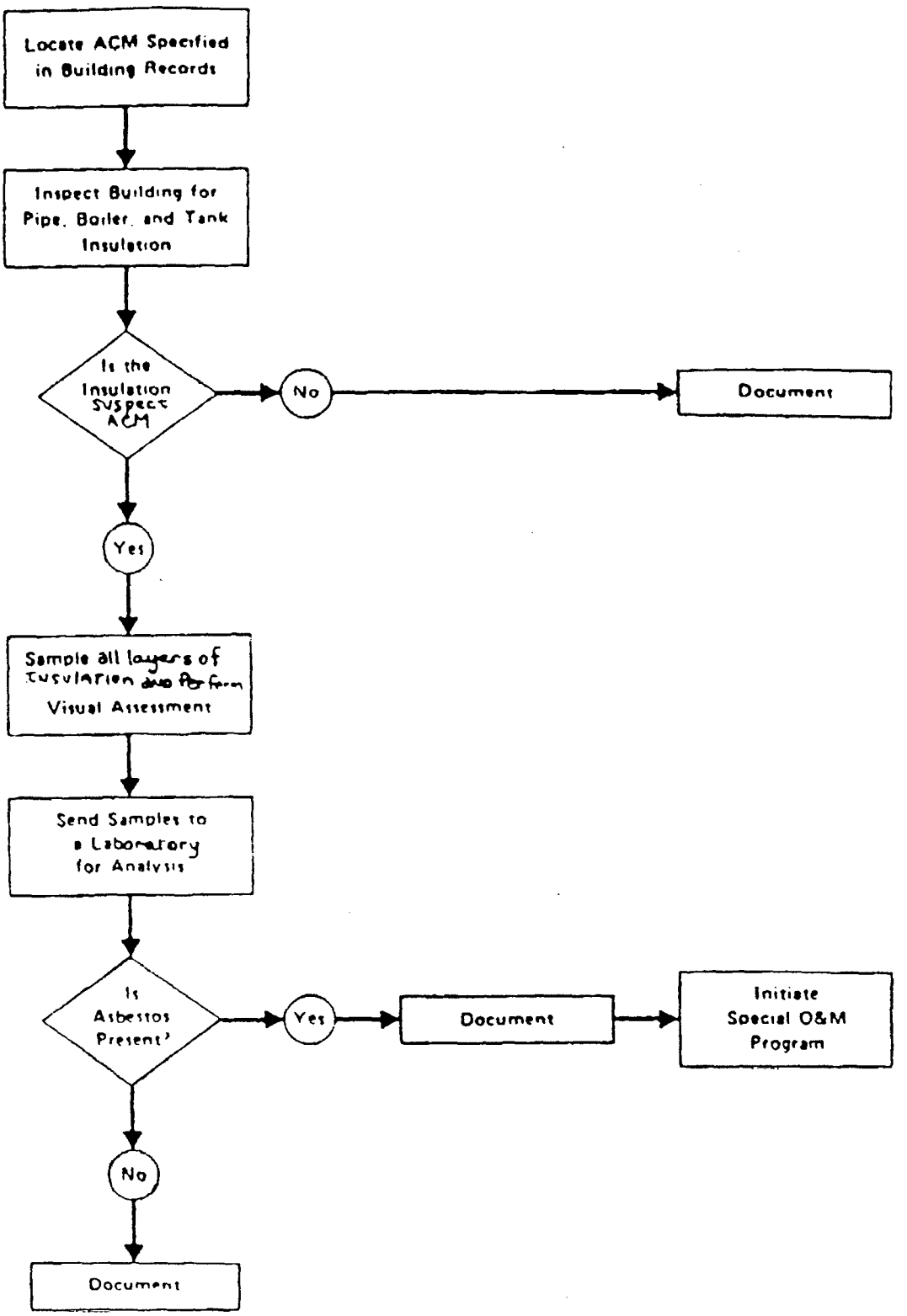


Figure 5 2 General survey procedures for pipe, boiler, and tank insulation.

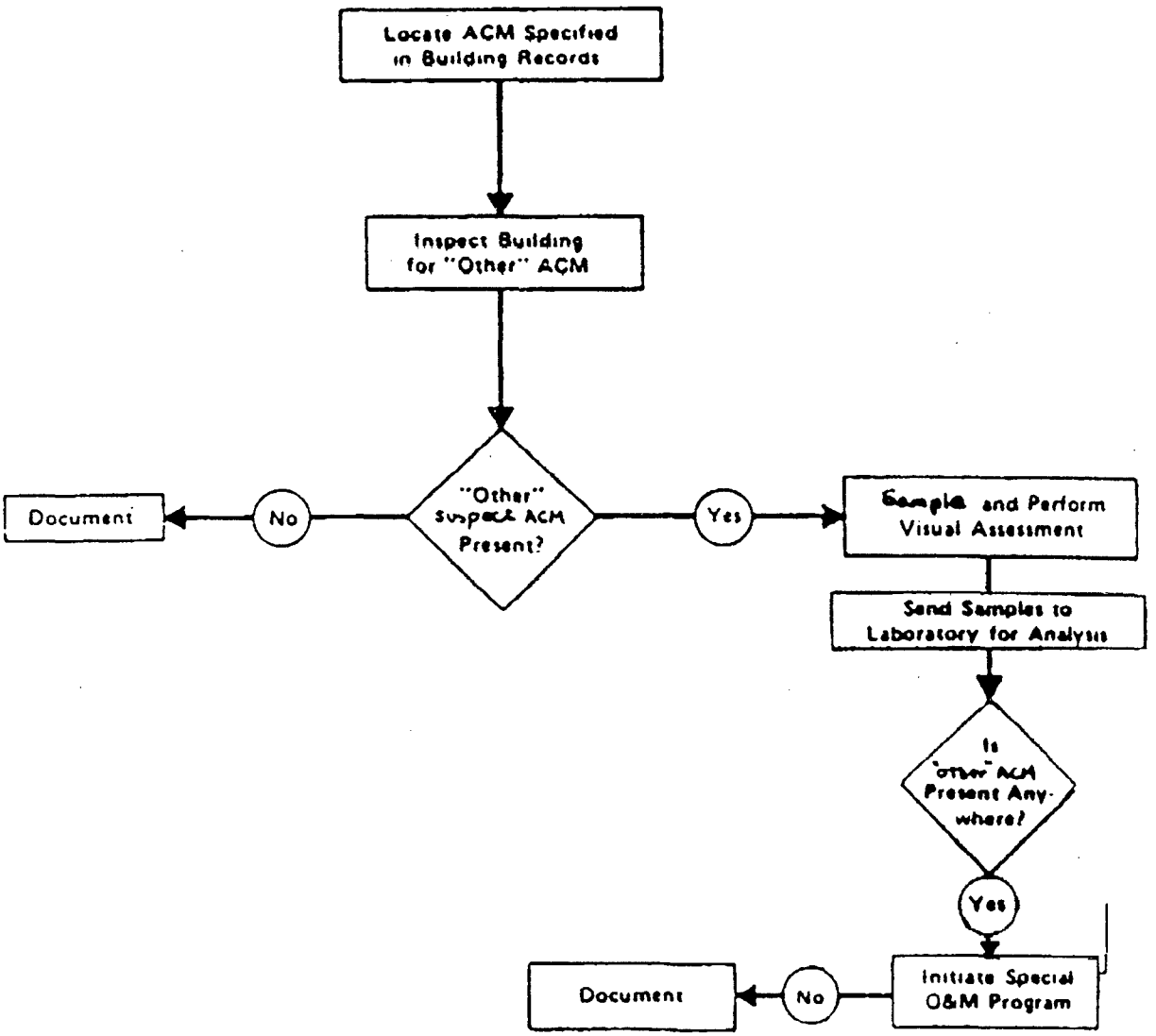


Figure 5 3. General survey procedures for "other" ACM.

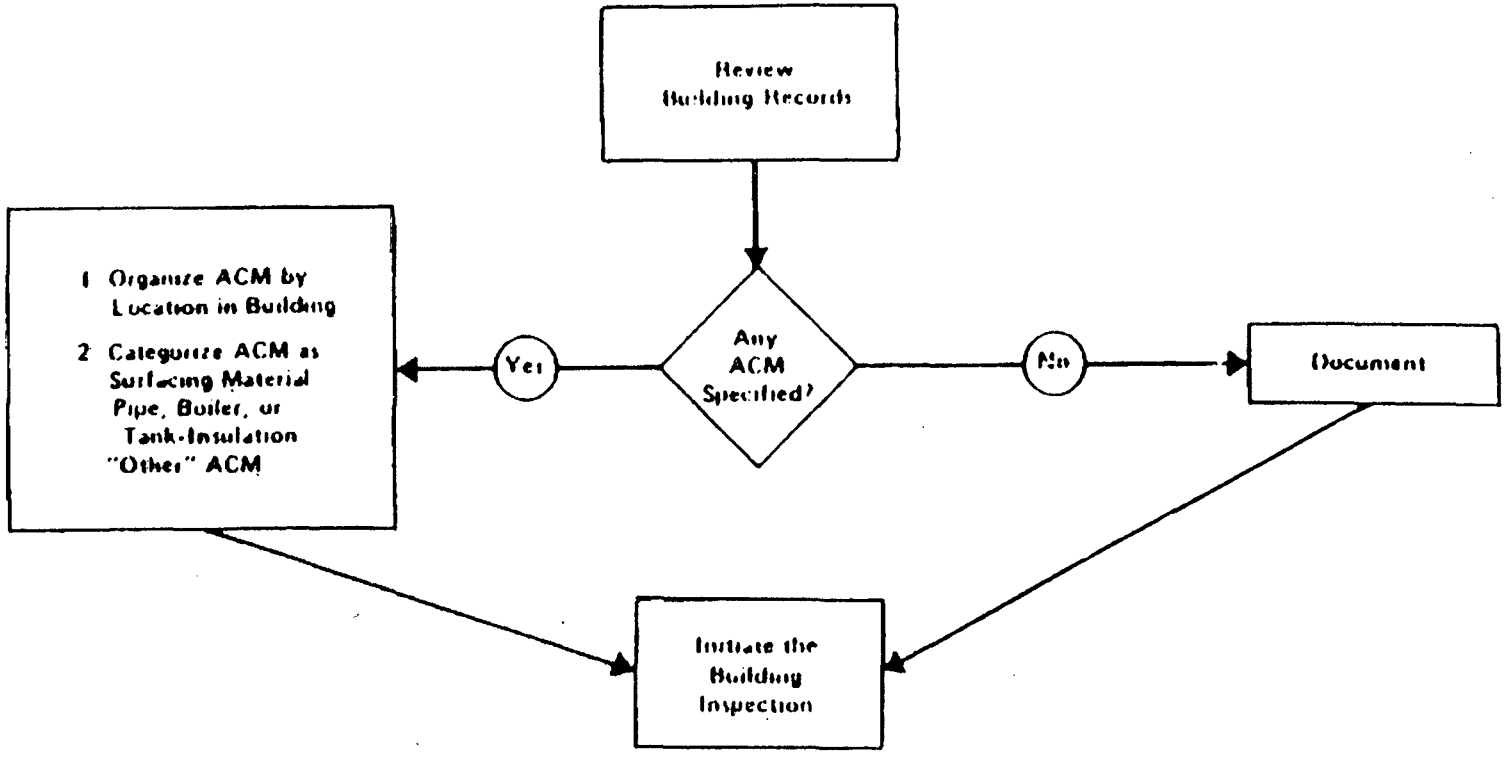


Figure 5-4. Building records review flowsheet

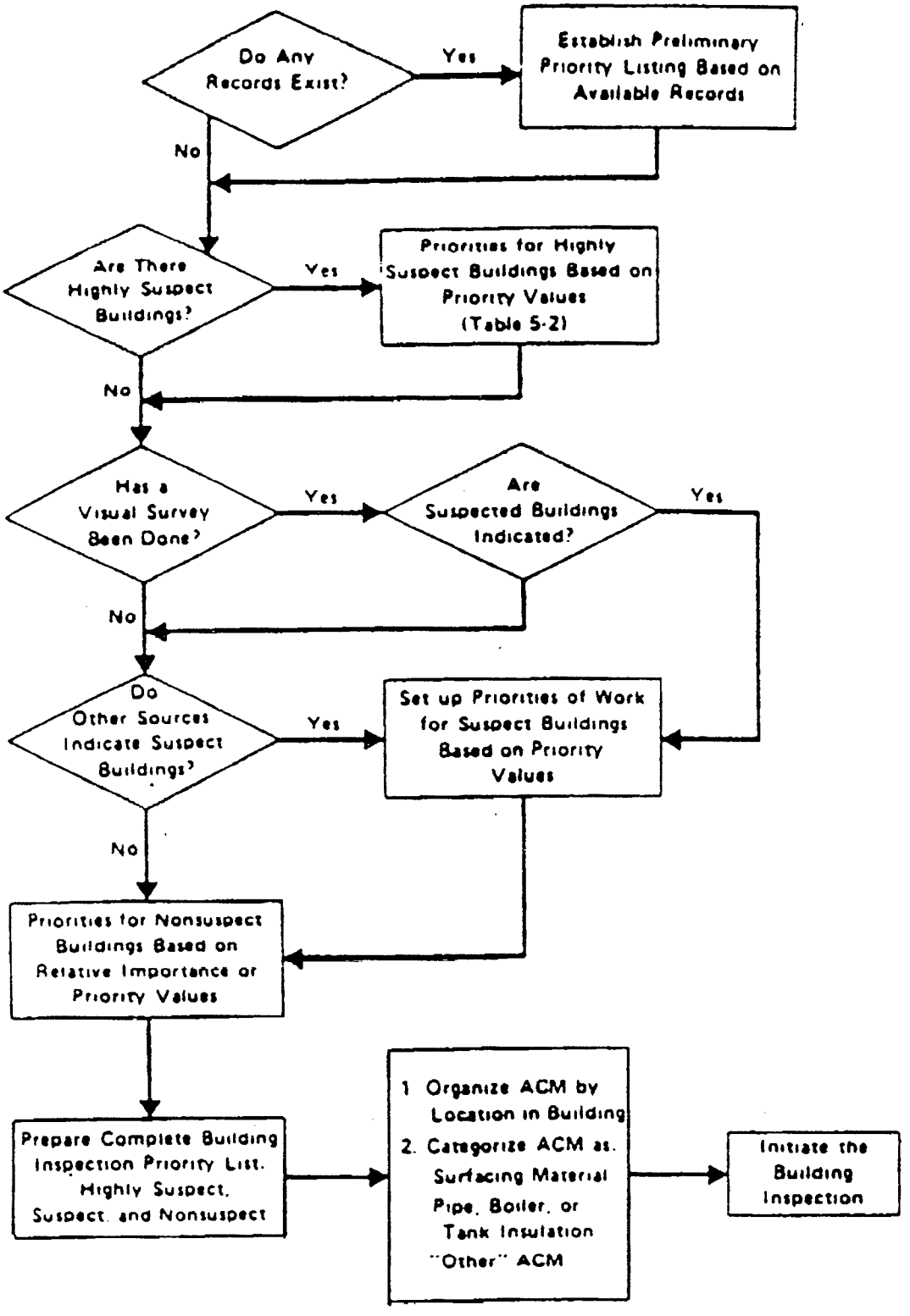


Figure 5-5. Building inspection priority procedure.

TABLE 5-2

Building inspection priority values

Category	No or low negative effect	Medium negative effect	High negative effect
Safety, health, or environmental	10	20	30
Mission, security	5	10	15
Morale or welfare	3	6	9
Support activities (including potential loss of building contents)	3	6	9

Note: Refer to the list of highly suspect buildings and follow these steps:

a. For each building, decide which categories are affected by the suspected asbestos problems.

b. Find out how much of a negative effect the problems are having in those categories.

c. Select the indicated priority values from the table, add them, and record the total priority value obtained opposite each building number. The building with the highest priority value is inspected first, second highest priority value second, and so on for all the highly suspect buildings. This building inspection priority process should be used as a tool to assist in the prioritization process. It is not intended to be rigidly followed. Final inspection prioritization rests with the Asbestos Management Team.

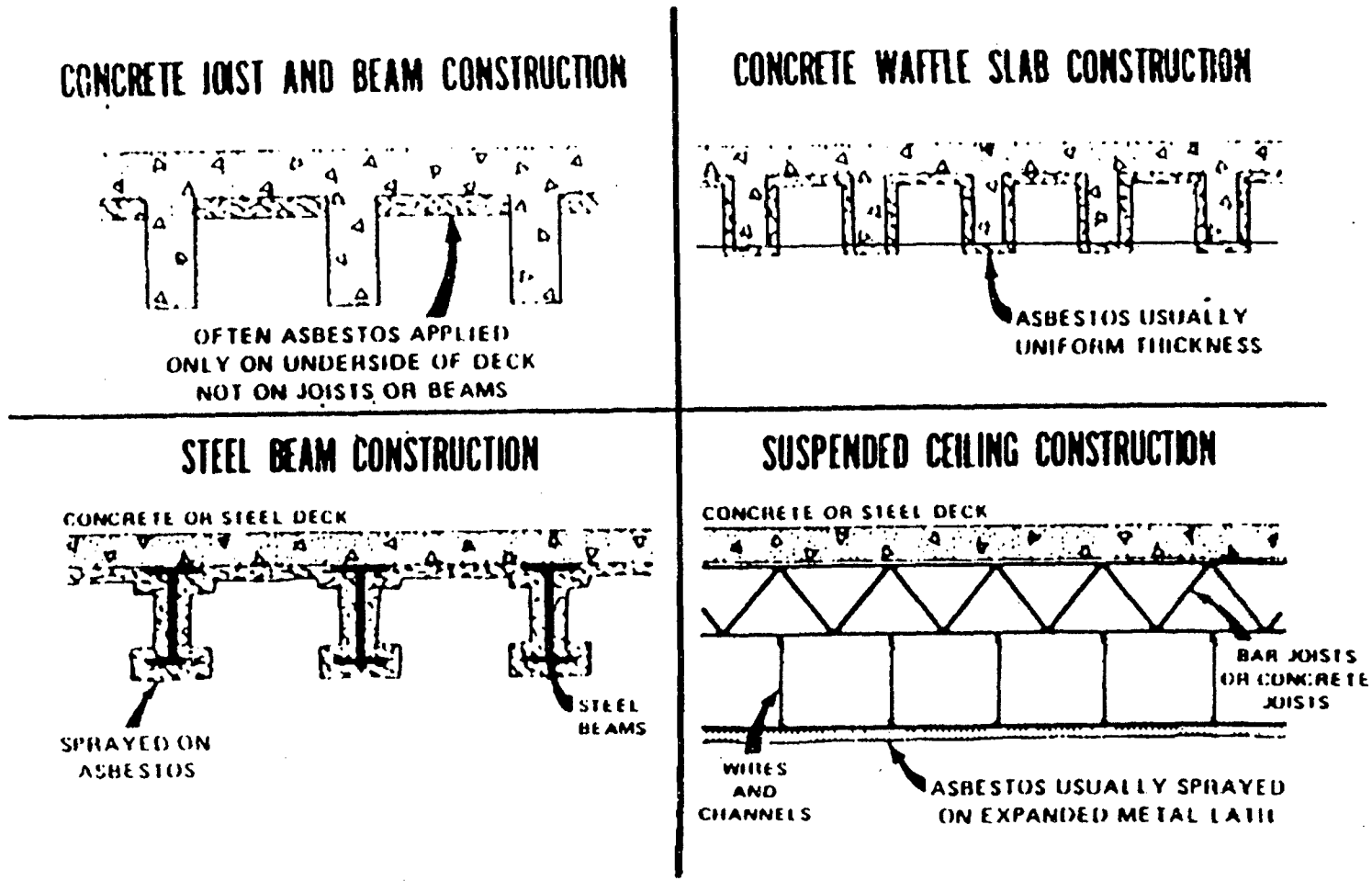


Figure 5 6 Types of ceiling construction.

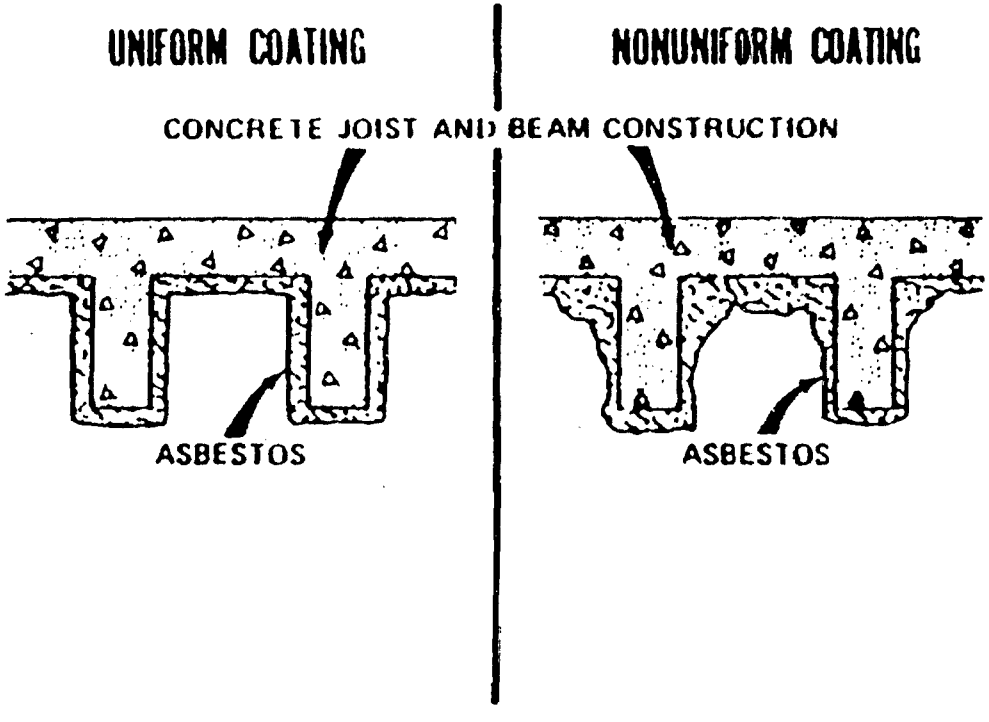


Figure 5 7. Thickness of ACM coating

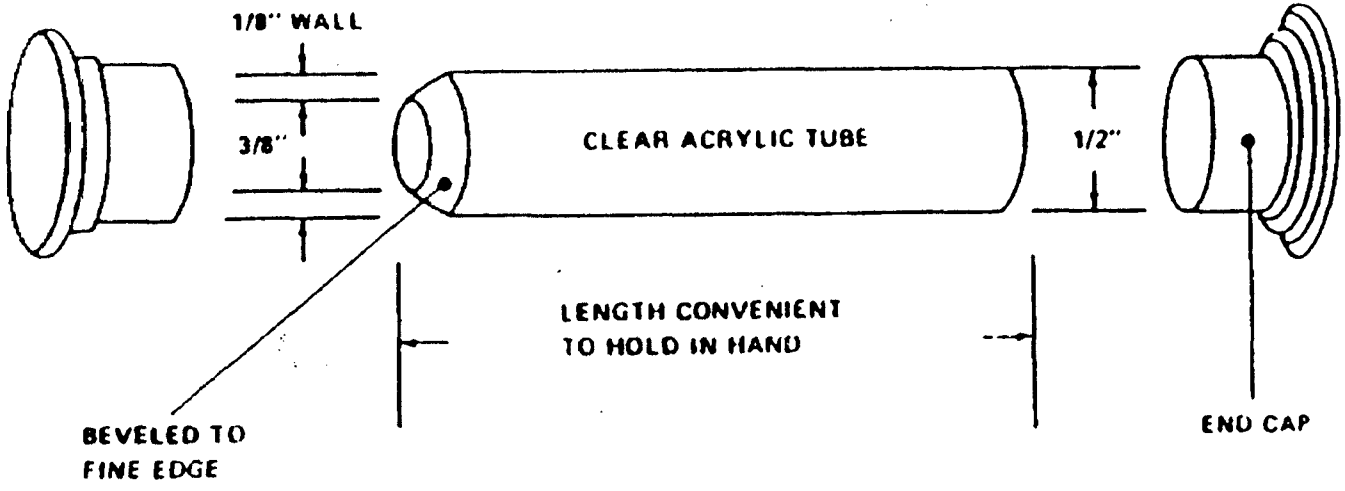


Figure 5 8. Sampler/container.

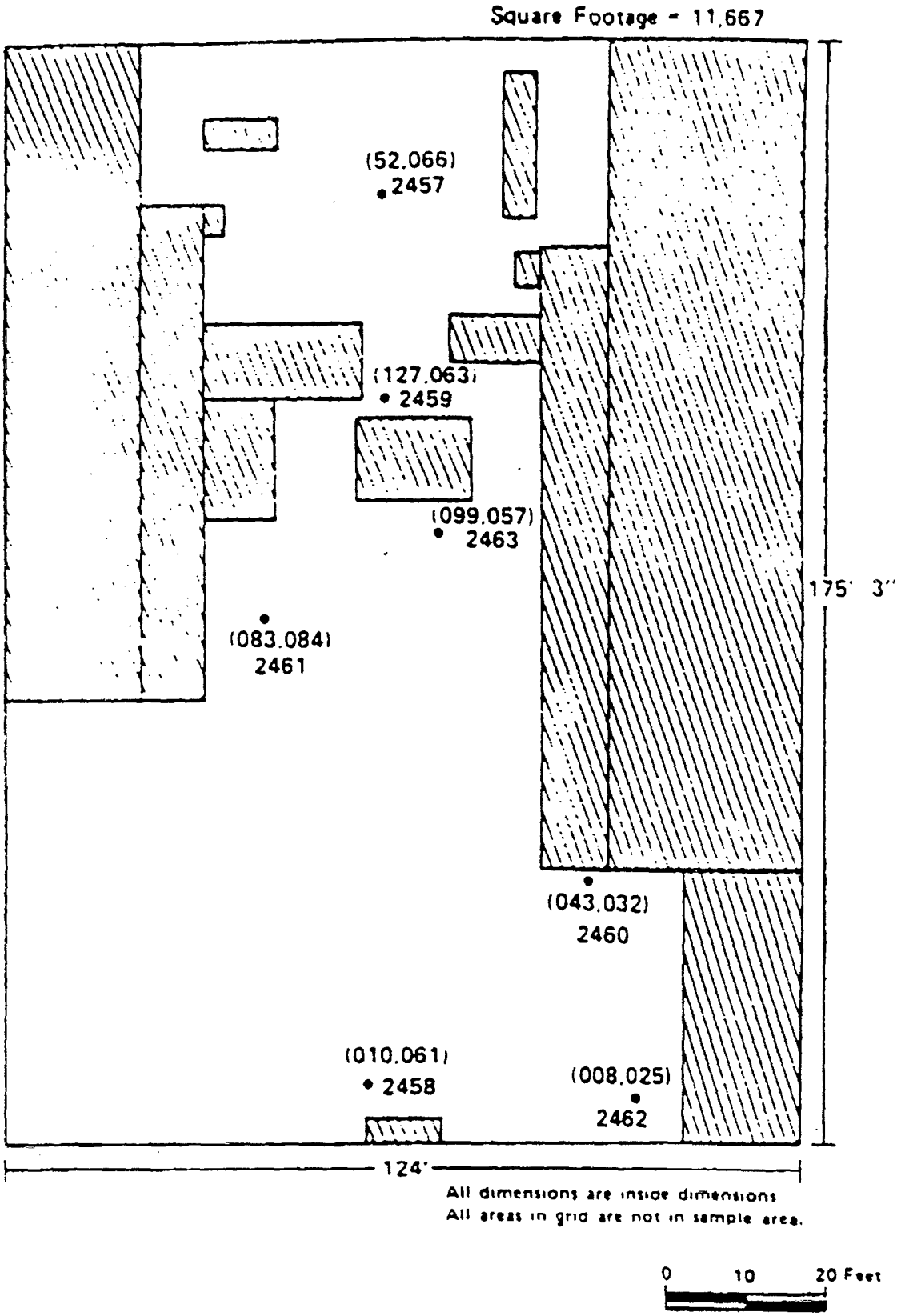


Figure 5-9. Sample building area diagram.

ACM SURVEY DATA SHEET

FACILITY: _____ BUILDING: _____ ROOM/AREA: _____ OPERATION: _____

EVALUATOR: _____ DATE: _____

ACM APPLIED TO:

☐ Ceiling

Type
- ☐ Concrete
- ☐ Tile
- ☐ Metal Deck
- ☐ Concrete Joists & Beams
- ☐ Corrugated Steel
- ☐ Suspended Metal Lathe
- ☐ Suspended Lay-in Panels
- ☐ Steel Beam or Bar Joists

Shape
- ☐ Flat ___
- ☐ Folded Plate ^^^
- ☐ Dome ⌒
- ☐ Barrel ⌒⌒
- ☐ Other (draw)

☐ Pipe _____

INSULATION

	Loose fill	Blanket	Thermal Brick	Sheeting	Other
☐ Boiler					
☐ Tank					
☐ Ductwork					

☐ Structural members _____

☐ Wall _____

☐ Other _____
(Floortile, Shingles, Roofing Felt, Wall Board, Panel, etc.)

ENVIRONMENTAL CONDITIONS:

Type of floor ☐ Concrete ☐ Tile ☐ Wood ☐ Carpet ☐ Other _____

Type of lighting ☐ Surface ☐ Suspended ☐ Recessed

No. of Lights _____

Type of ventilation system _____

ACM debris on floor, furniture, equipment, or other surfaces _____

☐ No ☐ Yes If yes, describe _____

Confirmation bulk sample no. _____ Results _____

ACM is subject to direct air stream or is located in proximity to air plenum

☐ No ☐ Yes If yes, describe _____

Machinery or equipment in area ☐ No ☐ Yes

If yes, describe _____

SPECIAL CONSIDERATIONS:

Utility maintenance frequency _____

Life-cycle projection for structure _____

Renovation schedule (past, present, future - dates) _____

Utilization by public _____

Other unique characteristics _____

DESCRIPTION OF MATERIAL:

	Line	Pipe	Boiler	Tank	Ductwork	Structural	Walls	Other
Type of ACM								
[1] Sprayed-on [2] Troweled-on [3] Air Cell [4] Block Type [5] Cementitious [6] Other								
Sq. or linear feet								
Thickness (in.)								
Diameter (in.)								
No. of runs								
No. of fittings								
Condition: Good/Fair/Poor								
Friability: Low/Moderate/High								
Uniformity: Yes/No								
Water damage: Yes/No/Source								
Vibration damage: Yes/No/Source								
Adhesion to underlying surface: Good/Moderate/Poor								
Texture: Fibrous/Cementitious/ Granular/Concrete-like								
Is ACM covered? Yes/No/Describe Cloth, Paper, Paint, etc.								
Is covering uniform? Yes/No/Describe								
Bulk sample no. 1								
no. 2								
no. 3								
Type asbestos								
% Asbestos								
Other comments								

AREA OCCUPANT/USER ACCESSIBILITY:

	NO	YES	DESCRIBE
Vulnerable to human activity			
Evidence of contact			
Material exposed			
Physical barriers			
User activities			

DRAFT
28 Nov 1988

GUIDE FOR
ASBESTOS HAZARD ASSESSMENT
IN U. S. ARMY FACILITIES

Prepared by

CERL-Environmental Engineering Team

Bernie Donahue

I. Introduction

The potential for fiber release and subsequent area contamination from asbestos-containing building material (ACBM) or other ACM can be assessed by evaluating several factors. These include the physical condition and characteristics of the material and its location and use. Information collected by inspecting of a facility or part thereof can be used to assess the occupants' potential exposure to ACM fibers. The asbestos management team can use this measure of exposure potential to compare different facilities in order to determine their relative asbestos health hazards. The assessment scheme can also be used as a basis for prioritizing corrective actions.

A survey is defined in this guide as the inspection of facilities to locate, confirm the identity of, and measure the amount of ACBM or other ACM present. An assessment further evaluates the ACBM or other ACM in terms of (1) its potential to be airborne, or the actual extent to which it is a source of airborne fibers [damage], and (2) to what extent humans in the area containing asbestos are exposed to airborne fibers. Army asbestos management programs will include an assessment as an integral part of a survey.

II. Background

One of the first assessment techniques to be evaluated by the US Environmental Protection Agency (USEPA) was air monitoring. The idea was simple: air samples in the area around ACM would be collected to determine the concentration of asbestos fibers in fibers per cubic centimeter (f/cc). These concentrations could be compared with the Occupational Safety and Health Administration (OSHA) workplace standards to obtain a relative measure of the health hazard. Because air monitoring reflects conditions only at the time of sampling, it cannot serve as a measure of longterm fiber release potential. Air monitoring alone is not recommended by the USEPA for asbestos exposure assessment, nor is it used as part of any of the several commonly employed assessment schemes.

In the preparing of this document, six assessment methods were evaluated:

(1) EPA "Purple Book" - Chapter 4;

(2) EPA Region VII - 1982;

(3) EPA Draft 7 initial regulation - 1986;

(4) US Navy TR883 - Chapter 5;

(5) US Air Force "GRADE" system (based upon the Versar, Inc. method); and

(6) Hall-Kimbrell modified Sawyer algorithm.

Method (1) uses an empirical approach and method (3) is based upon a "decision tree." Methods (2), (4), (5), and (6) are numerical rating schemes. Each of the methods has merit, is self-contained, and is designed to provide a relatively easy asbestos hazard assessment protocol.

In the 30 April 1987 issue of the Federal Register (52FR15820), the USEPA published a proposed rule under section 203 of Title II of the Toxic Substances Control Act concerning ACM in public and private schools. The background discussion states, "The negotiating committee generally agreed that assessment, as provided in the proposed regulation, should be flexible enough to accommodate a wide variety of acceptable and available methods and schemes. . . Assessment was perceived as the means of collecting and considering whatever data was necessary for the management planner to make an informed, responsible recommendation . . . consistent with response action requirements." The decision tree (method 3) in the USEPA initial regulation - Draft 7 (1986) was dropped due to committee sentiment that it was inappropriate for the USEPA to require a single assessment method.

In accordance with the current USEPA regulation governing asbestos abatement activities in schools, assessments of ACM hazards in schools must be performed by an accredited inspector, regardless of the assessment methodology used. The inspector is to gain his or her accreditation through attendance at an USEPA-approved 3 day training course and passing of an attendant examination. USEPA also suggests that states issuing the accreditation require the inspectors to have at least a high school diploma and perhaps an associate degree in particular fields (e.g., environmental or physical sciences).

In light of this regulation, it seems obvious that USEPA considers all assessment methods as merely tools to be used by or under the supervision of trained personnel.

II. Discussion

It was determined that an asbestos hazards assessment scheme for the Army has to meet the following criteria:

(1) Be easy to understand and to use,

(2) Be quantitative enough to provide a measure of hazard severity (Assessment Index) that will allow the Installation Commander to prioritize facilities in terms of the need for corrective action.

(3) Provide a list of factors that cannot be easily quantified or included in an algorithm, but which the asbestos management team should consider in their decisions on corrective actions.

None of the six methods reviewed met all three criteria. The three USEPA methods were judged too empirical, providing an insufficient numerical basis for meaningful prioritizing. The modified Sawyer algorithm offered by Hall-Kimbrell and the Navy TR-833-Chapter 5 schemes failed to meet the third criterion. Although logical, the Air Force GRADE system with the multiple regression model also failed to meet the third criterion. However, the assessment checklist in the GRADE system, which includes the factors concerning the ACM physical

characteristics and condition, location and use is the most comprehensive of the six methodologies.

The assessment scheme discussed in this document is a modified US Air Force "GRADE" system. The checklist, Figure 1a or 1b, is identical to that of the Air Force, but the multiple regression equation has been replaced with an assessment index matrix, Table 1. To use this scheme, a trained inspector works through the checklist making value judgments for each of the Damage/Risk and Exposure factors. A total numerical value for Damage/Risk and Exposure are derived which are then used in Table 1 to determine a letter assessment index. For each letter index, a recommended corrective management action is listed in Table 2.

The assessment scheme is intended for a trained inspector to use; that is, someone who is familiar with common ACBM and miscellaneous ACM and knows of the layout and activities of the facilities. The scheme applies only to friable asbestos, to include either sprayed- or trowelled-on surfacing materials or pipe, boiler, and tank thermal insulation. Other nonfriable forms of ACM shall be managed satisfactorily by an O&M program with abatement necessary only as part of facility alteration/repair, maintenance, or demolition.

An ACM Survey, locating, sampling, and measuring homogeneous areas of ACM should be conducted concurrently with the assessment, when possible. The term "homogeneous area" here refers to an area of surfacing material, thermal system insulation material, or miscellaneous material that is uniform in color and texture.

IV. The Friable ACM Assessment Checklist

A Friable ACM Assessment Checklist is provided in a five-page annotated format, Figure 1a and as a compact one-page format, Figure 1b. Both formats are reproduced directly from method 5, with only superficial changes. The five-page format is intended primarily as a training aid. As an inspector becomes familiar with the assessment factors and what each of the weighted conditions means, he or she will be able to use the compact format.

The checklist is divided into two parts. Part I addresses the extent of existing damage and the potential for a risk of damage to friable ACBM. Part II addresses exposure and contains factors that contribute to health hazards in the occupied facility being inspected.

The assessment factors, e.g., Physical Damage, Water Damage, Asbestos Content, and the annotated, value-weighted conditions in a Figure 1a or 1b are self-explanatory. Some of the other assessment factors, however, have additional considerations that could influence the inspector's choice of a value-weighted condition. The remainder of this section deals with these additional considerations.

The assessment factors listed in Part I, are concerned with damage. Measuring the extent of damage to the ACM or the potential for damage is an important part of the assessment. This is because, in most cases, damaged ACM will, under identical conditions, release more

airborne asbestos fibers than undamaged ACM. Also, the more extensive the damage, the greater the potential for fiber release.

The first assessment factor listed, Physical Damage to the sprayed- or trowelled-on surface ACM, has the five value-weighted condition of high, moderate, low, minimal, and none. An additional consideration for the inspector should be the age of the ACM. If the age is greater than 30 years, the normal deterioration of the binding agents may have produced a surface material that has a potential for fiber release per unit of surface area damaged much greater than for newer and similar surface ACM. An inspector who would normally rate a certain extent of damage as "Low" for 15-year-old sprayed-on ACM might want to rate the same extent of damage as "Moderate" for a 35-year-old material. The age of the ACM should also be considered when assessing the potential for damage from water and routine maintenance. In some assessment algorithms, the design of a roof above the ACM is considered. There is a greater potential for rainwater damage to ACM under a flat roof than under a sloped or hipped roof.

In considering the Asbestos Content factor, the assumption is that as the percentage of asbestos in the ACM increases so does the potential for airborne fiber release. This would undoubtedly be true if the same binding agent were used in all ACM. However, not all ACM are created equal. It is quite possible that an ACM with an easily degraded starch binder (water soluble) and an asbestos content of 15 percent would have a greater fiber release potential than an ACM with 50 percent asbestos and a water insoluble binder. The choice of a weighted-value condition by an inspector should reflect this consideration only if very specific and relevant information is available.

V. Management Considerations

Even though an assessment index may accurately reflect the existing asbestos health hazard within a facility, it most likely will not be an accurate measure of the asbestos management problem. No economic or social factors enter into the assessment index. These factors often represent the greatest obstacles in the management or control of asbestos hazards. A set of appropriate considerations is listed below.

A. Cost Considerations (Estimating Cost Effectiveness)

1. Cost of the abatement (Contractor's estimate + in-house personnel dedication)
2. Cost of temporarily relocating personnel and equipment for the abatement.
3. Cost of nonproductivity resulting from relocation of personnel and equipment.
4. Cost savings in preplanned remodeling, renovation and/or repair projects resulting from abatement activities.
5. Cost savings associated with enhanced use of rooms, areas, or buildings which have been purged of ACM hazards.

B. Morale Considerations

1. Effect of abatement-related personnel relocation of on morale (see A-3).
2. Effect of the notification of the need for abatement action on the morale of those individuals who occupy the space. Any abatement action will alert them to the fact that they had been working in a space judged to be a high risk environment.

C. Miscellaneous Considerations

1. Effects of flooding, wind, and fire damage on ACM integrity.
2. Climatological restrictions on abatements. (Amended water can freeze thus making spraying impossible!)
3. Geographical restrictions on abatements--OCONUS installations may have special problems.
4. High security areas, problems with unauthorized access or potential compromise.
5. Special facility use (child care centers and hospitals).

Fig. 1a
ARMY FRIABLE ACM ASSESSMENT CHECKLIST

Installation: Bldg/Rm Nos.:

Facility/Office: Inspector (date):

Sample Numbers (Air and Bulk):

PART I: DAMAGE or RISK

-Physical. Assess damage based on visible evidence of work surface accumulation or the condition of the sprayed-on or trowelled-on surface materials.

____(5) High - Dislodged pieces are evident on work surfaces.
____(4) Moderate - There is evidence of visible material fallout.
____(2) Low - There some evidence of material fallout.
____(1) Minimal - There are isolated and very small areas of material damage or fallout.
____(0) None - No damage or evidence of any material fallout.

-Water.

____(3) Yes - Visible water damage.
____(0) No - No water damage.

-Proximity to Items for repair. If both A and B apply, score the one with the highest rating. (Check all that apply. Maximum of 3 points.) How far is the material from routine maintenance areas?

A. Sprayed-on or Trowelled-on: Could the material be damaged by routine maintenance?

____(3) < 1 ft or a ceiling panel contaminated with ACM must be removed.
____(2) 1 ≤ ? < 5 ft
____(1) ≥ 5 ft
____(0) ≥ 5 ft and no routine maintenance.

B. Pipe, Boiler, or Duct Insulation: Could damage occur as a result of routine maintenance.

____(3) A ceiling panel contaminated with ACM must be removed.
____(1) Yes
____(0) No

-Type of Material. If area or room contains numerous categories of material, score the friable material with the largest area. Check all other categories that are found.

____(0 - 4) Other material, i.e., wallboard, ceiling tile, or floor tile with exposed friable ends, abrasions, etc.
____ (1) Boiler and/or pipe
____ (3) HVAC - Suspected ACM on exterior or ducts
____ (4) Ceilings or Walls

-Potential for Contact by Occupants. How far is the friable sprayed-on, trowelled-on, or damaged material from the heads of the room or area occupants, regardless of whether there is a barrier? (High, medium, and low refer to the chance of the room or area personnel actually disturbing the ACM.)

<10 ft		≥10 ft	
____(8)	High	____(5)	High
____(5)	Medium	____(3)	Medium
____(2)	Low	____(0)	Low

-Asbestos Content. Use the percentage for the material that has the highest probability of becoming airborne.

____(1) 1 < % ≤ 30
____(3) 30 < % ≤ 50
____(5) > 50 %
____ All bulk samples from the friable surface or damaged material(s) indicate asbestos. If so, NO HAZARD.

Bulk sample results

Sample No.	Type Asbestos	%	Source

DAMAGED (D) TOTAL_____(Max 28, Min 1) Evaluator (date)_____

ARMY FRIABLE ACM ASSESSMENT CHECKLIST
Part II: EXPOSURE

-Friable. Defined by USEPA: "hand pressure can crumble, pulverize, or reduce to powder when dry." Score the friability of the surface or damaged material.

____(6) High - Material is fluffy and/or the slightest hand pressure can dislodge it. A slight breeze may disperse the material.
____(3) Moderate - Material can be dislodged or scraped or crumbled by hand.
____(1) Low - Material is firmly bound, difficult to scrape off by hand.

-Area of visible surface or damaged friable material.

____(0) $< 10\ ft^2$ These small areas should be repaired ASAP.
____(1) $10 \leq ft^2 < 100$
____(2) $100 \leq ft^2 < 1000$
____(3) $\geq 1000\ ft^2$

-Surface material. Refers to the ability of the surface material to hold fibers for reentrainment. If more than one type, score the roughest. If the material is exposed friable asbestos, score as rough.

____(4) Rough. Difficult to clean with a HEPA vacuum.
____(3) Pitted. Difficult to clean with a damp cloth but cleanable with a HEPA vacuum.
____(2) Moderate. Can be cleaned with a damp cloth.
____(1) Smooth. Easily cleaned with a damp cloth.

-Ventilation. Check all categories that apply. (Maximum 7 points)

____(5) The interior of the supply duct or plenum is coated or littered with friable material or is within 5 feet of a supply diffuser or fan and the condition of the material may result in fibers being entrained into the airflow.
____(2) The interior of the return air duct or plenum is coated or littered with friable material and is part of a recirculating system.
____(1) Air being supplied to the room or area is: (1) drawn from an area where the potential for asbestos fiber release is possible, or (2) part of a recirculating system where fibers may be drawn into the system.
____(0) None of the above applies.

-Air Movement. This refers to the general air movement in the room or area that may affect the friable surface or damaged material.

____(5) Material is subjected to routine turbulent or abrupt air movement.
____(2) Material is exposed to perceptible or occasional air streams.
____(0) No perceptible air flow in the room or area.

-Activity. Refers to forces acting on the surface covered, i.e., vibrational, water or steam, etc.

____(5) High - Friable surface or damaged material is subject to constant vibration (mechanical room).
____(2) Medium - Occasional vibration. (a warehouse where forklifts are used, next to an active runway, kitchen)
____(0) Low - Administrative office, library, classroom, storage room, stairway or corridor, waiting room, etc.

-Floor.

_____(4) Carpet or an extremely rough surface difficult to clean by HEPA vacuum or by a damp cloth.
_____(2) Seamed or rough surface (e.g., uncoated concrete)
_____(1) Smooth continuous surface (e.g., finished or coated concrete, smoothly joined tile, etc.).
____(0-4) Unique situations (wood or dirt floors with varying degrees of smoothness).

-Barriers. If both A and B apply, score the one with the highest rating. Check all that apply. (Maximum of 4 points)

A. Refers to sprayed-on or troweled-on material on ceiling or walls.

____(1) Suspended ceiling or accessible secondary wall.
____(2) Encapsulation or covered with nonasbestos material.
____(3) Railing or chicken wire.
____(4) None.

B. Pipe, boiler, duct, or other surface or damaged materials. Percent of total exposed and visible to the occupants.

____(1) $\leq$ 25%
____(2) 25 < % $\leq$ 50
____(3) 50 < % $\leq$ 75
____(4) 75 < % $\leq$ 100

-Population. This involves defining the average occupancy and outside visitor traffic (do not count visitors from within the building) of a room or area based on an 8 hour per day exposure. For example, a reception area in a DEH shop normally has 15 individuals assigned to the office. They see approximately 240 customers from outside the building over an 8 hour day. Each customer is serviced and gone within 30 minutes.

([240 persons X 0.5 hours] / 8 hours) + 15 occupants = 30

..... Score as 2

____(1) $\leq$ 9 or for corridors
____(2) 10 $\leq$ Pop $\leq$ 200
____(3) 201 $\leq$ Pop $\leq$ 500
____(4) 501 $\leq$ Pop $\leq$ 1000
____(5) $\geq$ 1001 for medical facilities, youth centers, child care facilities or residential buildings, regardless of the population.

EXPOSURE (E) TOTAL_____(Max 43, Min 5) Evaluator (date)_____

Fig. 1b

ARMY FRIABLE ASBESTOS ASSESSMENT CHECKLIST

Form # __

BASE:_____ BLDG/RM NOS:_____ FACILITY/OFFICE:_____ INSPECTOR (DATE)___

..... Part I: DAMAGE/RISK .....

* Physical Damage, Visible evidence:_____(5) High:_____(4) Moderate:_____(2) Low:_____(1) Minimal:_____(0)None
* Water Damage: ____(3) Yes; _____(0) No
* Proximity to Items for Repair. If both a. and b. apply score the one with the highest rating. (Max 3 pts). How far? :
"a". Sprayed or Trowelled-on:_____(3) <1 ft or ceiling panel contam.; ____(2) 1≤?<5 ft:___(1) ≥5 ft; ____(0) ≥5 ft No rout. maint.
"b". Pipe, Boiler, or Duct Insulation, Damage by routine maint. ? : ____(3) ceiling panel contam.; ___(1) Yes; ____(0) No
* Type of Mat'l:____(0-4) Other Friable mat'l:____(1) Boiler and/or pipes;____(3) HVAC;____(4) Ceilings or walls
* Potential for Contact: "<10 ft" ____(8) High;____(5) Medium;____(2) Low; "≥10 ft" ____(5) High; ____(3) Medium;____(0) Low
* Asbestos Content, % with highest prob: ____(1) 1<%≤30;____(3) 30<%≤50;_____(5) >50%; NO HAZARD all samples no asbestos

Damage (D) Total_____

..... Part II: EXPOSURE .....

* Friable: _____(6) High;_____(3) Moderate;_____(1) Low
* Area of Visible Mat'l: _____(0) <10 ft^2;_____(1) 10≤ ft^2<100;_____(2) 100≤ ft^2<1000;_____(3) ≥1000 ft^2
* Walls: _____(4) Rough; _____(3) Pitted;_____(2) Moderate;_____(1) Smooth
* Ventilation (max 7 pts): _____(5) Interior supply;_____(2) Interior return;_____(1) Air supply-Fiber potential;____(0) None
* Air Movement Affecting Mat'l: ____(5) Routine turbulent or abrupt air mvmt;___(2) Exposed to percept air;____(0) No percept air
* Activity: ____(5) High-constant vibes;____(2) Medium-occasional vibes;____(0) Low-admin office, classroom, waiting room, etc.
* Floor: ____(4) Carpet;____(2) Seamed or rough surface;____(1) Smooth continuous surface;_____(0-4) Unique situations
* Barriers. If both a. and b. apply, score theone withthe highest rating. check all that apply (Max of 4 pts):
"a". Sprayed or trowelled-on on ceiling or walls: ____(1) Suspend ceiling;___(2) Encapsulation;___(3) Railing or wire;___(4) None
"b". Pipe, Boiler, Duct, or Other Mat'l: _____(1) ≤25%;_____(2) 25<%≤50;_____(3) 50<%≤75;_____(4) 75<%≤100
* Population: ____(1)≤9 or lor corridors;____(2)10≤Pop≤200;____(3)201≤Pop≤500;____(4)501≤Pop≤1000;____(5)≥1001 or med or youth

Exposure (E) Total_____

Sample Numbers (Air & Bulk):_____

Table 1

Determination of an Assessment Index

Using the Damage/Risk and Exposure values derived from the checklist (Figure 1a or 1b), enter the matrix below and find the corresponding assessment index.

		Exposure (4 < E < 43)			
		43-26	25-17	16-8	7-4
Damage/Risk (1 < D < 28)	28-17	A	A	A	B
	16-11	A	B	C	D
	10-5	A	B	C	E
	4-1	A	C	D	F

Table 2

Assessment Index	Recommended Management Corrective Actions
A	Immediate Action - Requires assessment by accredited personnel* (in-house or contractor) who are experienced in and qualified to conduct asbestos assessments. Possible follow-up actions may include isolation of the area and the restriction of access and/or immediate removal of the ACM. If removal is indicated, action planning should include a detailed survey. This condition will likely involve a near term expenditure of funds. Managers must know exactly what needs to be done to eliminate the asbestos hazard and how to use available funds most effectively.
B	Action as Soon as Possible - Requires assessment by accredited personnel* (in-house or contractor) who are experienced in and qualified to conduct asbestos assessments. Initiate a Special O & M** program immediately. Possible follow-up actions may include the limiting of access to the area and the scheduling of removal during periods of low activity in the facility, not waiting for the normal repair and maintenance cycle.
C	Planned Action - Requires assessment by accredited personnel* (in-house or contractor) who is experienced in and qualified to conduct asbestos assessments. Initiate a Special O & M** program. Removal should be scheduled as part of the normal repair and maintenance cycle of a facility, minimizing cost and disturbance.
D	Repair - Initiate Special O & M** using accredited personnel*. Damaged areas should be repaired, where "repair" means returning damaged ACBM to an undamaged condition or to an intact state so as to contain fiber release. Schedule removal when practical and cost effective. Take preventative measures to reduce further damage.
E	Monitoring - Continue Special O & M** using accredited personnel*. Take steps to prevent damage to the ACBM or other ACM. Monitor frequently the condition of all ACM.
F	No Immediate Action - Continue Special O & M** using accredited personnel* until major renovation or demolition requires removal or until assessment factors change.

* Accredited personnel are industrial hygienists (American Board of Industrial Hygiene (ABIH) certified or who meet the Office of Personnel Management's 0690 classification standard) and other trained persons with a minimum of 1 year experience in asbestos assessment activities and who are accredited in the specific area they will be responsible for (inspector management planner, abatement designer, contractor, supervisor, and abatement worker) as specified in Section 206 of Title II of TSCA.

** An O & M program may include enclosure and encapsulation, where appropriate, to increase effectiveness.

Certificate of Completion

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AHERA-APPROVED ASBESTOS
BUILDING INSPECTOR TRAINING COURSE

Be it known that:

WILLIAM G. ALEXANDER

is hereby awarded this certificate which attests to this achievement.

FORT COLLINS, COLORADO
JANUARY 29-31, 1990

For purposes of accreditation
required under Section 206 of the
Toxic Substance Control Act (TSCA)

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Earle Thomas

CERTIFICATE NUMBER: 524-64-7581
ACCREDITATION EXPIRES: JAN. 31, 1991

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FEBRUARY 1-2, 1990

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COLORADO STATE UNIVERSITY · EDUCATION · SERVICE · RESEARCH · EXTENSION · 1870 ·

Earle Thomas

CERTIFICATE NUMBER: 524-64-7581
ACCREDITATION EXPIRES: FEBRUARY 2, 1991

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ENVIRONMENTAL
Training Center

CERTIFIES THAT

Joan Henehan

has successfully completed

The **EPA-APPROVED AHERA ANNUAL REFRESHER COURSE** for Inspector
and has passed the required examination in that discipline

This course is EPA-approved under Section 206 of the Toxic Substances Control Act (TSCA)

Course date 1/15/91
No. of hours 4
Exam date N/A
Certificate No. DR011591-14
Expires 1/14/92

Lester K Ablin
Authorized Signature

Invalid without raised seal

Laboratory Certification

National Institute of Standards and Technology

NVLAP

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION

BULK ASBESTOS FIBER ANALYSIS NVLAP LAB CODE 1122

Versar Laboratories, Inc.
6850 Versar Center
Springfield, VA 22151
Marcie Wilson Phone: 703-750-3000

Accreditation Renewal Date: April 1, 1992

NVLAP Test Method Code	Test Method Designation
18/A01	40 Code of Federal Regulations Chapter I (1-1-87 edition) Part 763, Subpart F, Appendix A or the current U. S. Environmental Protection Agency method for the analysis of asbestos in building materials by polarized light microscopy.

Nancy M. Trahey

for the National Institute of Standards and Technology

United States Department of Commerce
National Institute of Standards and Technology

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BULK ASBESTOS FIBER ANALYSIS

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Nancy M. Trahey
For the National Institute of Standards and Technology

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Analytical Procedures

5.4.2.2.2 Quantitation of Asbestos Content

Asbestos quantitation is performed by a method equivalent to the point counting procedure described in Appendix II.

1. Examine the sample with a stereo microscope; pick through sample with needles and forceps to view entire sample. Estimate the percent composition of the fibrous material by distinct appearance.

2. Use polarized light microscope to view bulk preparation from 4.2.1 (4) to confirm percentages.

5.4.3 Miscellaneous Samples

Prepare samples according to following guidelines. Extract fibers and identify according to method used with bulk samples.

1. Soil samples - See Appendix IV for SOP.

2. Vinyl asbestos tile (VAT) - See Appendix V for SOP.

3. Wipe/Tape samples - See Appendix VI for SOP.

4. Roof samples - See Appendix VII for SOP.

TABLE 1-2—CENTRAL STOP DISPERSION STAINING COLORS[a]

Mineral	RI Liquid	η⊥	η∥
Chrysotile	1.550[HD]	Blue	Blue-magenta
Amosite	1.680	Blue-magenta to pale blue	Golden-yellow
	1.550[HD]	Yellow to white	Yellow to white
Crocidolite[b]	1.700	Red magenta	Blue-magenta
	1.550[HD]	Yellow to white	Yellow to white
Anthophyllite	1.605[HD]	Blue	Gold to gold-magenta
Tremolite	1.605[HD][c]	Pale blue	Gold
Actinolite	1.605[HD]	Gold-magenta to blue.	Gold
	1.630[HD][c]	Magenta	Golden-yellow

[a] From reference 9.
[b] Blue absorption color.
[c] Oblique extinction view.

1.7.2.4 *Quantitation of Asbestos Content*

Asbestos quantitation is performed by a point-counting procedure or an equivalent estimation method. An ocular reticle (cross-hair or point array) is used to visually superimpose a point or points on the microscope field of view. Record the number of points positioned directly above each kind of particle or fiber of interest. Score only points directly over asbestos fibers or nonasbestos matrix material. Do not score empty points for the closest particle. If an asbestos fiber and a matrix particle overlap so that a point is superimposed on their visual intersection, a point is scored for both categories. Point counting provides a determination of the area percent asbestos. Reliable conversion of area percent to percent of dry weight is not currently feasible unless the specific gravities and relative volumes of the materials are known.

For the purpose of this method, "asbestos fibers" are defined as having an aspect ratio greater than 3:1 and being positively identified as one of the minerals in Table 1-1.

A total of 400 points superimposed on either asbestos fibers or nonasbestos matrix material must be counted over at least eight different preparations of representative subsamples. Take eight forcep samples and mount each separately with the appropriate refractive index liquid. The preparation should not be heavily loaded. The sample should be uniformly dispersed to avoid overlapping particles and allow 25-50 percent empty area within the fields of view. Count 50 nonempty points on each preparation, using either

- A cross-hair reticle and mechanical stage; or
- A reticle with 25 points (Chalkley Point Array) and counting at least 2 randomly selected fields.

For samples with mixtures of isotropic and anisotropic materials present, viewing the sample with slightly uncrossed polars or the addition of the compensator plate to the polarized light path will allow simultaneous discrimination of both particle types. Quantitation should be performed at 100X or at the lowest magnification of the polarized light microscope that can effectively distinguish the sample components. Confirmation of the quantitation result by a second analyst on some percentage of analyzed samples should be used as standard quality control procedure.

The percent asbestos is calculated as follows:

% asbestos = (a/n) 100%

where

a = number of asbestos counts,
n = number of nonempty points counted (400).

If a = 0, report "No asbestos detected." If 0 < a < 3, report "< 1% asbestos".

The value reported should be rounded to the nearest percent.

1.8 References

1. Paul F. Kerr, *Optical Mineralogy*, 4th ed., New York, McGraw-Hill, 1977.

2. E. M. Chamot and C. W. Mason, *Handbook of Chemical Microscopy, Volume One*, 3rd ed., New York: John Wiley & Sons, 1958.

3. F. Chayes, *Petrographic Modal Analysis: An Elementary Statistical Appraisal*, New York: John Wiley & Sons, 1956.

4. E. P. Brantly, Jr., K. W. Gold, L. E. Myers, and D. E. Lentzen, *Bulk Sample Analysis for Asbestos Content: Evaluation of the Tentative Method*, U.S. Environmental Protection Agency, October 1981.

5. U.S. Environmental Protection Agency, *Asbestos-Containing Materials in School Buildings: A Guidance Document*, Parts 1 and 2, EPA/OTS No. C00090, March 1979.

6. D. Lucas, T. Hartwell, and A. V. Rao, *Asbestos-Containing Materials in School Buildings: Guidance for Asbestos Analytical Programs*, EPA 560/13-80-017A, U.S. Environmental Protection Agency, December 1980, 96 pp.

7. D. H. Taylor and J. S. Bloom, Hexametaphosphate pretreatment of insulation samples for identification of fibrous constituents, *Microscope, 28*, 1980.

8. W. J. Campbell, R. L. Blake, L. L. Brown, E. E. Cather, and J. J. Sjoberg. *Selected Silicate Minerals and Their Asbestiform Varieties: Mineralogical Definitions and Identification-Characterization*, U.S. Bureau of Mines Information Circular 8751, 1977.

9. Walter C. McCrone, *Asbestos Particle Atlas*, Ann Arbor: Ann Arbor Science Publishers, June 1980.

SECTION 2. X-RAY POWDER DIFFRACTION

2.1 Principle and Applicability

The principle of X-ray powder diffraction (XRD) analysis is well established.[1,2] Any solid, crystalline material will diffract an impingent beam of parallel, monochromatic X-rays whenever Bragg's Law,

$\lambda = 2d \sin \theta$,

is satisfied for a particular set of planes in the crystal lattice, where

λ = the X-ray wavelength, Å;
d = the interplanar spacing of the set of reflecting lattice planes, Å; and
θ = the angle of incidence between the X-ray beam and the reflecting lattice planes.

By appropriate orientation of a sample relative to the incident X-ray beam, a diffraction pattern can be generated that, in most cases, will be uniquely characteristic of both the chemical composition and structure of the crystalline phases present.

Unlike optical methods of analysis, however, XRD cannot determine crystal morphology. Therefore, in asbestos analysis, XRD does not distinguish between fibrous and nonfibrous forms of the serpentine and amphibole minerals (Table 2-1). However, when used in conjunction with optical methods such as polarized light microscopy (PLM), XRD techniques can provide a reliable analytical method for the identification and characterization of asbestiform minerals in bulk materials.

For *qualitative analysis* by XRD methods, samples are initially scanned over limited diagnostic peak regions for the serpentine (~7.4 Å) and amphibole (8.2-8.5 Å) minerals (Table 2-2). Standard slow-scanning methods for bulk sample analysis may be used for materials shown by PLM to contain significant amounts of asbestos (>5-10 percent). Detection of minor or trace amounts of asbestos may require special sample preparation and step-scanning analysis. All samples that exhibit diffraction peaks in the diagnostic regions for asbestiform minerals are submitted to a full (5°-60° 2θ; 1° 2θ/min) qualitative XRD scan, and their diffraction patterns are compared with standard reference powder diffraction patterns[3] to verify initial peak assignments and to identify possible matrix interferences when subsequent quantitative analysis will be performed.

TABLE 2-1—THE ASBESTOS MINERALS AND THEIR NONASBESTIFORM ANALOGS

Asbestiform	Nonasbestiform
SERPENTINE	
Chrysotile	Antigorite, lizardite
AMPHIBOLE	
Anthophyllite asbestos	Anthophyllite
Cummingtonite-grunerite asbestos ("Amosite")	Cummingtonite grunerite
Crocidolite	Riebeckite
Tremolite asbestos	Tremolite
Actinolite asbestos	Actinolite

TABLE 2-2—PRINCIPAL LATTICE SPACINGS OF ASBESTIFORM MINERALS[a]

Minerals	Principal d-spacings (Å) and relative intensities			JCPDS Powder diffraction file[b] number
Chrysotile	7.37$_{vs}$	3.65$_{s}$	4.57$_{w}$	21-543[c]
	7.36$_{vs}$	3.66$_{vs}$	2.45$_{s}$	25-645
	7.10$_{vs}$	2.33$_{vs}$	3.55$_{s}$	22-1162 (theoretical)
"Amosite"	8.33$_{vs}$	3.06$_{s}$	2.756$_{s}$	17-745 (nonfibrous)
	8.22$_{vs}$	3.060$_{s}$	3.25$_{s}$	27-1170 (UICC)
Anthophyllite	3.05$_{vs}$	3.24$_{vs}$	8.26$_{s}$	9-455
	3.06$_{vs}$	8.33$_{s}$	3.23$_{vs}$	16-401 (synthetic)
Anthophyllite	2.72$_{vs}$	2.54$_{vs}$	3.480$_{vs}$	25-157
Crocidolite	8.35$_{vs}$	3.10$_{s}$	2.720$_{s}$	27-1415 (UICC)
Tremolite	8.38$_{vs}$	3.12$_{vs}$	2.705$_{vs}$	13-437[c]
	2.706$_{vs}$	3.14$_{s}$	8.43$_{w}$	20-1310[c] (synthetic)
	3.13$_{vs}$	2.706$_{vs}$	8.44$_{w}$	23-666 (synthetic mixture with richterite)

[a] This information is intended as a guide, only. Complete powder diffraction data, including mineral type and source, should be referred to, to ensure comparability of sample and reference materials where possible. Additional precision XRD data for amosite, crocidolite, tremolite, and chrysotile are available from the U.S. Bureaus of Mines.[4]
[b] Fibrosity questionable.

Accurate *quantitative analysis* of asbestos in bulk samples by XRD is critically dependent on particle size distribution, crystallite size, preferred orientation and matrix absorption effects, and comparability of standard reference and sample materials. The most intense diffraction peak that has been shown to be free from interference by prior qualitative XRD analysis is selected for quantitation of each asbestiform mineral. A "thin-layer" method of analysis[5,6] is recommended in which, subsequent to comminu

Quality Control Procedures

5.6 QUALITY CONTROL

It is the responsibility of all microscopists to perform and document the required QC specified in this section for the test to be performed. In the event of failed QC, the section chief must be notified, and the failure documented in the station logbook or on the laboratory notebook sheet. The accuracy and precision results derived from the QC program are to be used to determine acceptability of results to be reported. The performance based criteria (coefficent of variation, standard deviation) will be used to determine accept/reject basis. In the event QC fails, the result test must be repeated. Should repeated failures occur, the data must be qualified or identified as a failed test. Alternatively, the sample may be sent to a second "referee lab" for a second opinion.

5.6.1 Air Samples

5.6.1.1 Microscope Quality

Follow procedures in Section 5.5.1 to maintain microscope quality and calibration. Calibration must be documented in the work station logbook. All maintenance must also be recorded in the logbook.

5.6.1.2 Blind Recounts

Perform a blind recount on one out of every ten slides counted for duplicate analyses. Use the following criteria to determine whether to reject a pair of results.

$$(FB2 - FB1) \text{ exceeds } 2.77\ (FB)\ (CVfb)$$

where: FB1 = Lower fiber count on the filter (total fiber)
FB2 = Higher fiber count on the filter (total fiber)
FB = Average of the two total fiber counts
CVfb = Coefficient of variation derived by laboratory from historical data (should be 0.12 to 0.15 but not greater than 0.30).

Recount any pair rejected by use of above criteria. Also recount the rest of the group of ten samples counted with the duplicate sample for which results were unacceptable.

5.6.1.3 Reference Sample Analysis

1. Count one reference sample per ten filter samples counted.

2. Use above accept/reject criteria pairing count with known value.

3. If a reference sample count is rejected, recount all samples counted with the reference sample for which the results where unacceptable.

5.6.1.4 Interlaboratory Round Robin

Interlaboratory Round Robins provide a measure of comparability of the counting performance of the laboratory microscopists to other laboratories. Versar Laboratories, Inc. participates in at least one interlaboratory round robin annually with a number of other laboratories. Since this effort is voluntary, the number and identity of other participants may change. Currently, there are four other participants. For each round, one laboratory provides ten previously analyzed samples which are circulated among laboratories until all samples have been analyzed by all laboratories.

5.6.1.5 Proficiency Testing

VLI participates in one external proficiency testing program for air samples, the NIOSH Pat Program. All qualified microscopists count air samples which are received quarterly. The section chief chooses the results from a single individual to submit to NIOSH. Also, selected microscopists that conduct field testing participate in the AIHA Registry Program.

5.6.2 Bulk Samples

5.6.2.1 Microscope Quality

Follow procedures in section 5.5.2 to maintain microscope quality and calibration.

5.6.2.2 Refractive Index Solutions

Refractive index solutions must be calibrated weekly with an accuracy of 0.004. Calibration procedure must include temperature accuracy of 2°C. RI solution calibration is recorded in the work station logbook.

5.6.2.3 Analysis Review

Perform an analysis review of all samples analyzed. Ensure a different person performs the review to check for clerical and obvious analytical errors. If errors are suspected confer with analyst or laboratory section chief. Initial and date the analysts notebook sheet.

5.6.2.4 QC Duplicate Analyses

1. Perform reanalysis of 10% of all samples analyzed. Ensure that a different person performs the reanalysis.

2. Report results on Bulk Quality Control Analysis Report. Results of QC analysis and original analysis should differ no more than $\pm$ 50%. If the two analyses fall outside the above range, both analysts need to confer and resolve the problem. Retest if necessary. If problem is with the original analysis, reanalyze similar samples within the batch to the satisfaction of the laboratory supervisor. Results are to be entered into the computer for QC chart and statistical determinations.

Problems must be documented and communicated to the section chief. QC duplicate results will be used to monitor the accuracy and precision of reporting for the laboratory and the individual microscopists.

5.6.2.5 Semimonthly QC Analysis

1. Twice a month, all microscopists will perform reanalysis of previously analyzed samples--one for each microscopist plus two standard samples. Results will be recorded on laboratory notebook sheets, one for each sample.

2. Results will provide an indication of microscopist and lab accuracy and precision. See specific implementation in Appendix II.

3. Results for each microscopist will be included in laboratory notebook. QC data will be submitted to laboratory QA officer as part of the monthly QC report. A copy of individual and calculated data will be kept on file in the asbestos lab.

5.6.2.6 Interlaboratory QC

Periodically, at the contractually required frequency, send a representative portion of analyzed samples to a referee laboratory for comparison. Summarize results and include the following information: sample number, original results, QC results.

5.6.2.7 Proficiency Testing

Analyze all material sent from NIST. Ensure all analysts/microscopists perform the analyses before discussing results. Discuss results and agree upon one result for each material. Keep a copy of individual results in personnel file and laboratory results in proficiency testing file. Compare individual results with NIST results when available.

5.6.3 Control of Cross-contamination

1. Open only one sample at a time under hood.

2. Follow cleaning procedures in section 5.4.2.1 to ensure a clean sample preparation area.

3. Periodically change filters and request hood velocity measurements be taken to ensure airflow in hoods are adequate to keep contamination inside hoods during sample preparation.

4. At the beginning of every shift prepare blank samples using each of the opened bottles of refractive index solution to check for contamination of the liquids. Document blank results in station logbook.

5. Contamination is considered present if any asbestos fibers are present in the RI solution. If asbestos fibers are detected at any concentration, corrective action is required. The contaminated solution will be discarded, and a new bottle opened.

5.6.4 Corrective Action

In the event of failed QC or problems encountered during analysis, the microscopist must communicate the problem to the section chief. A record of the failed QC will be made on the laboratory notebook sheet on the Comment/Problem/ Corrective Action section, or in the station logbook if appropriate.

Should problems be brought to the section chief's attention by the clients that disagree with the results, then a reanalysis will be performed internally, and a split sample sent to a second lab for a "referee" opinion if necessary. A corrective action report is to be sent to the QAO informing him of the complaint and the plan for resolution.

Microscopist corrective action is required when

- The microscope will not calibrate
- The RI solutions are contaminated
- Blanks are contaminated
- Duplicate precision is outside control window
- Recount precision is outside window

Section chief corrective action is required when

- Equipment fails
- Microscopists are unable to correct problems above
- Microscopists fail blind PE and external PE samples
- Client complaints are registered
- Accreditation is revoked
- Schedules are missed